

The MINING CONGRESS JOURNAL

Volume 15

MAY, 1929

No. 5

Coal Convention

Sixth Annual Convention of
Practical Coal Operating Men
A Mining School in the Corn Belt
Safety in Coal Mining

Contributors:

A. C. Callen
R. L. Hair
B. C. Klugh
R. H. Edmonds
W. L. Churchill
George H. Gilman
R. G. Wayland
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Humphrey D. Smith
G. B. Southward
W. H. Gates
Gordon MacVean
Fred C. Carstarphen
Walter B. Dalrymple
George H. Lindsay
George Krebs

The South and Industrial Progress
Research—An Essential in Industrial Progress
Profits—The Basis of All Industrial Progress

Legislative Review

Drilling With the Modern Hammer Drill
Haulage at the Homestake Gold Mine
Safety Work of Calumet & Arizona

Mechanization—The Big Question
Reports on the Mechanization Survey
Rock Dusting Practice at the Nemacolin Mine
Aerial Tramways of the Pittsburgh Coal Co.

Mechanized Mining With
Scrapers—Conveyors—Pit-Car Loaders

and Exposition

Eliminate that dangerous incentive

IN metal mines, fuse is furnished to the miners in proper lengths for their use. There is, therefore, no motive for the miner to use dangerously short lengths, and accidents due to this cause are rare.

A thought for your consideration—How can the same results be obtained in the coal mining industry?

What arrangement can be made between company and miners to supply fuse in a manner to eliminate the use of dangerously short fuse lengths for economy's sake?

We believe that the elimination of the *incentive* for using dangerously short lengths of fuse will eliminate the accidents or possibility of accidents attendant on such practice.

May we suggest that here is a subject worthy of careful consideration by every coal operator.

The Ensign-Bickford Company
Simsbury, Conn.

*The Original Manufacturers of
Safety Fuse*



Established 1836

*Fuse should be cut long enough for the end to extend well out
of the mouth of the bore hole when the primer is in place*

The Low Cost of Good Pipe

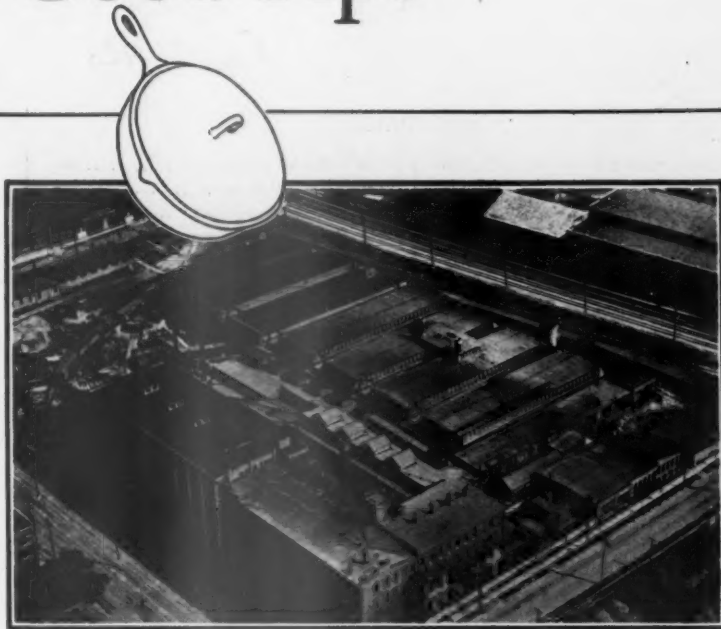


SKILLETS are what the Griswold Manufacturing Company set out to make in 1868; and they tried to make as good skillets as it was possible to produce, using high quality cast iron. They have continued to make good skillets for sixty years, always using the best materials, employing the best workmanship, and studying to improve their product in every way. Now at their well equipped plant in Erie, Pa., with 600 workers, they make a varied line of cooking utensils of both cast iron and aluminum, and also a line of electric cooking appliances.

The faith of the management has been that a superior article would win its way unflinching to better markets.

The company has prospered and its wares are known everywhere throughout the United States.

Starting with such a belief in quality and having this belief confirmed as touching their



Well equipped plant of the Griswold Manufacturing Company, Erie, Pa., makers of cooking utensils and electrical cooking appliances.

own business, it is not strange that when the Griswold Company buy for themselves, they prefer goods of character. It is not strange that they have been users of Byers Pipe from the outset. They have used it almost exclusively, for all pur-

poses, in steam, gas, and water lines. They declare that they "have felt they were repaid in this practice," even though the cost exceeded that of ordinary pipe.

Such a record reflects a sincere conviction that quality is actually worth striving for on the part of those who make a product, and worth paying for on the part of those who use it.

A. M. BYERS COMPANY

Established 1864 Pittsburgh, Pa.

New York Houston Los Angeles Philadelphia
Chicago Detroit Cleveland Atlanta
Boston Tulsa St. Louis Birmingham
Cincinnati Rochester Kansas City

Distributors in All Jobbing Centers



BYERS PIPE

GENUINE WROUGHT IRON

The MINING CONGRESS JOURNAL

VOLUME 15

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No. 5

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Practical Operating Men's Department

METAL

*Drilling in Rock
With the Modern Hammer Drill
Haulage at the Homestake Gold Mine
Safety Work at Calumet & Arizona*

COAL

*Rock Dusting at Nemacolin Mine
Aerial Tramways Serving Cleaning
Plants of the Pittsburgh Coal
Company
Mechanized Mining on Long Wall
Faces
Room-Pillar Mining With Conveyors
Mining With Pit-Car Loaders*

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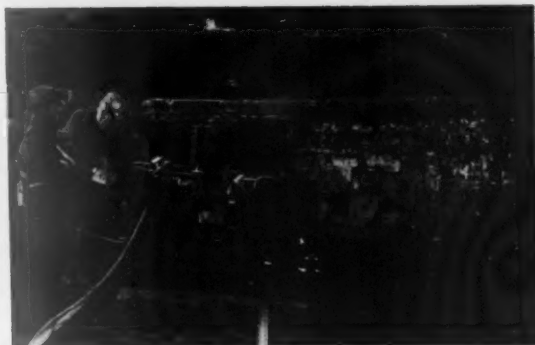
EDGAR SINNOCK

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Skinny Discovers a Top Cutter with an Adjustable Cutter Bar



Skinny: What's the matter with the bloomin' thing? It's tilted over like the leanin' tower of Pisa. How do they expect us to cut coal with a crooked thing like that?

Bill: Look at the track; that's what makes it tilt that way.

Skinny: That's a H—— of a track, ain't it. Suppose we will have to go to some other room now.

Bill: Oh, no, this is a Jeffrey "Arc-wall," look at this little doodad

here and then keep your eye on that cutter bar. See how easy it is to tilt it until it is level.

Skinny: By golly that explains it. When Bull Sullivan quit the mine because they were going to take the 29-C away from him and give him one of them freak top cutters, he put the cutter bar in the coal and wrote "Go to H——" and signed it "Bull" with great big letters cut in the coal.

Catalog No. 475-C completely describes the Jeffrey 29-C Arcwall including the 3-point suspension feature. Other types of Jeffrey Coal Mine Equipment are also described in this book. May we send you a copy.

The Jeffrey Manufacturing Company

958-99 North Fourth St., Columbus, Ohio

BRANCH OFFICES:

New York Philadelphia Pittsburgh Scranton, Pa. Charleston, W. Va. Chicago Denver Salt Lake City Birmingham

SALES AND SERVICE STATIONS:

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Jeffrey Mfg. Co., Ltd., of Canada, Head Office Montreal; Branch Office Toronto; Service Station 210 Ninth Ave. W., Calgary

JEFFREY COAL MINE EQUIPMENT

See It at Cincinnati—

The Latest Advance in Mechanical Power Transmission Equipment !

The Westinghouse-Nuttall organization, which for more than forty years has been recognized as a leader in improving the efficiency and economy of mechanical power transmission, now offers to industry a further improvement in equipment for this purpose.

You are cordially invited to carefully examine the exhibit of this most recent development at the American Mining Congress Exposition.

—also

included in our exhibit will be other Westinghouse-Nuttall products that are helping to bring down production costs by reducing maintenance, and operating delays. On display will be locomotive trolley equipment, speed reducing units, and BP gears for mining machinery and locomotives—the gears that have a guaranteed life four times longer than any untreated steel gears in identical service.

In
Spaces
211-218



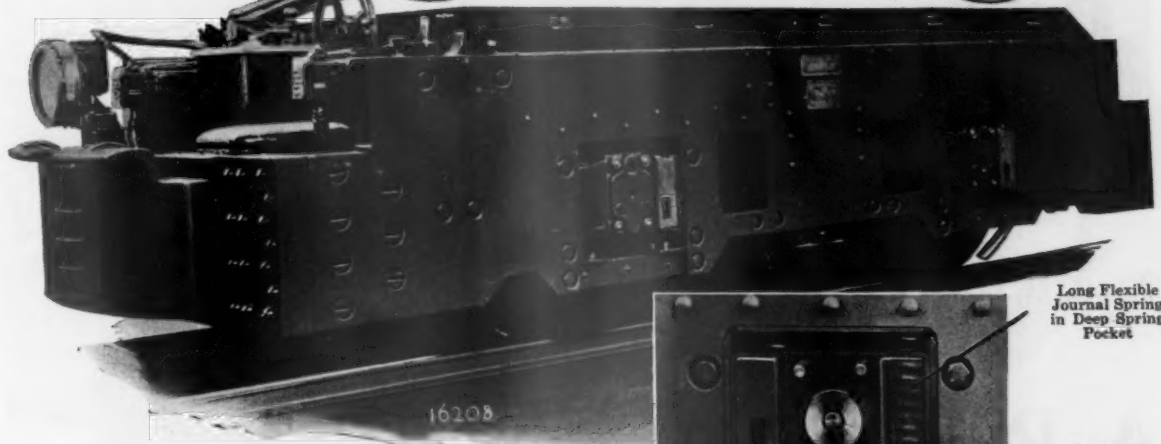
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
Nuttall Works Pittsburgh, Pa.

Sales Offices in All Principal Cities of
the United States and Foreign Countries

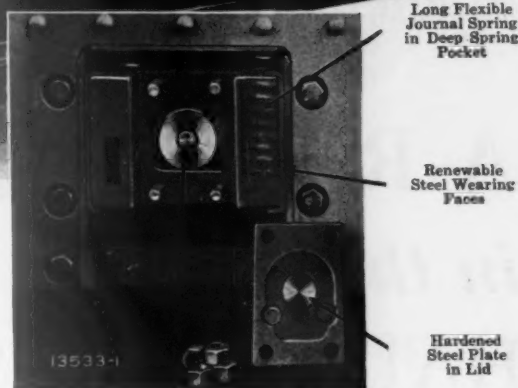
Canadian Agents: Lyman Tube & Supply Company

Westinghouse

8 Big Springs



**Give
Real Flexibility
and Resilience**



Long Flexible
Journal Spring
in Deep Spring
Pocket

Renewable
Steel Wearing
Faces

Hardened
Steel Plate
in Lid

Hardened Pin in End of Axle to
Take End Thrust

EIGHT long and strong helical springs, two in each journal box, give ample flexibility and resilience to Jeffrey Mine Locomotives, allowing them to stay on any track that will hold a mine car. No additional wearing parts are necessary for perfect stability.

These springs are placed in deep pockets on either side of the axle so that the weight is carried well below the middle of the axle. This stabilizes the journal box and prevents any swaying motion that might bind the journal box in the guides. Thus the needed flexibility is provided in a very simple way without additional mechanism that might diminish the accessibility of other working parts.

All surfaces of contact between the journal boxes and the locomotive frame are provided with steel wearing strips which may be replaced easily and at little expense.

Complete details of Jeffrey Haulage and Gathering Locomotives will be sent on request

The Jeffrey Manufacturing Company

958-99 North Fourth Street, Columbus, Ohio

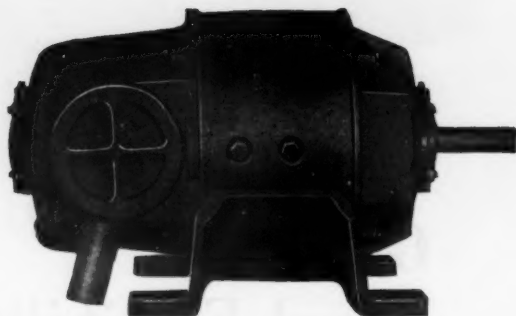
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Winchester, Ky., 122 North Main Street Salt Lake City, 153 West Second South Street

Jeffrey Manufacturing Company, Ltd., of Canada, Head Office, Montreal; Branch Office, Toronto; Service Station, 210 Ninth Avenue W., Calgary

JEFFREY COAL MINE EQUIPMENT



Photo courtesy
Brown Fayro
Company



A Reliable Link in the HAULAGE SYSTEM

QUICK, scheduled haulage, so essential to modern mining, requires **SAFE** as well as efficient gathering equipment.

The Room Hoist shown above is approved as "Permissible" by the U.S. Bureau of Mines. This machine is equipped with the Westinghouse Explosion-tested Room Hoist motor and control.

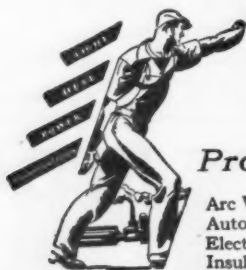
The Explosion-tested motor and control embody all the necessary safeguards for preventing any sparks or internal explosions from igniting surrounding gas. This equipment is

especially adapted to room hoists, but may be applied with equal success to loading machines, conveyors and other similar applications inside or outside the mine.

The Westinghouse Explosion-tested Room Hoist motor has built-in stamina to give many years of consistent performance under the most severe haulage conditions—in addition to its assurance of safely guarding life and property while operating under hazardous conditions.



WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.
SALES OFFICES IN ALL PRINCIPAL CITIES OF THE UNITED STATES AND FOREIGN COUNTRIES



Westinghouse

T 30513

Products for the Mining Industry include:

Arc Welding Equipment
Automatic Substations
Electric Locomotives
Insulating Materials

Lighting Equipment
Line Material
Micarta Gears
Motor-Generators

Motors and Control
Nuttall Speed Reducers
Protective Devices
Switchboards

ANOTHER ONE OF THE 52 MINING MACHINERY
MANUFACTURERS THAT USES **SKF** BEARINGS

Jeffrey Mfg. Co.



YOU MAY BUY A
BEARING AS A
BARGAIN BUT
TRY AND GET A
BARGAIN OUT OF
USING IT

For
Nothing is apt to cost so much
as a bearing that cost so little.

SKF
Puts the
Right Bearing
in the
Right Place

On All Types Of Mining Equipment **SKF** Bearings Prove To Be The Cheapest

"**W**E FEEL that their application has been carefully studied and the true economic significance placed on their performance, in relation to that of the entire machine or process, **SKF** Bearings have made a creditable showing in our mining equipment," says the General Master Mechanic and Chief Electrical Engineer of a mine in which **SKF** Anti-Friction Bearings have been in service over 15 years on mining locomotives, centrifugal pumps, trolley bases, cutting machines, etc.

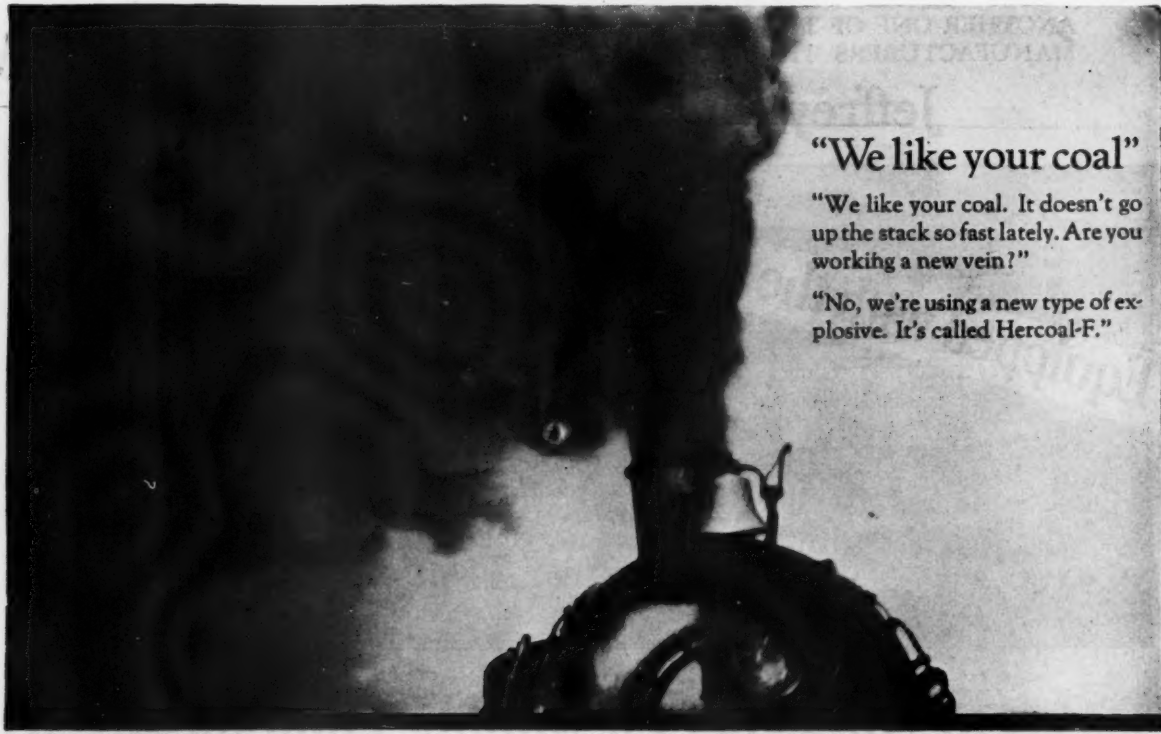
It is because **SKF** Bearings have been a definite factor in reducing operating costs and insuring greater life of equipment before overhauling is necessary that the Jeffrey Mfg. Co., uses **SKF** — the highest priced bearing in the world — in its equipment. And in the long run this policy is justified for the user of Jeffrey mining machinery is sure to get constant, unfailing service which makes **SKF** the lowest in cost per bearing hour. And 51 other mining manufacturers feel the same about **SKF**.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2288

SKF

Ball and Roller Bearings



"We like your coal"

"We like your coal. It doesn't go up the stack so fast lately. Are you working a new vein?"

"No, we're using a new type of explosive. It's called Hercoal-F."

When an Alabama mine operator started using Hercoal-F, excessive stack losses by a southern railroad stopped abruptly.

Hercoal-F is a permissible explosive of high cartridge count which automatically results in cushioned blasting of coal. It is a time saver, in that it produces practically no noxious fumes and smoke. Hercoal-F costs no more per ton of coal blasted than black

or pellet powder, and possesses all the safety factors of permissibles. Let us send you detailed information about this patented product manufactured exclusively by the Hercules Powder Company, 934 King Street, Wilmington, Delaware. Write today for this information.

For further information on other explosives and blasting supplies, see pages 298 to 301 of the 1929 Keystone Coal Mining Catalog.



HERCOAL-F



They can be working instead of waiting

You cannot afford idle time in your mine—time spent waiting for smoke to clear away after blasting.

Use Hercoal-F. It is the new type permissible explosive, so remarkably free from smoke that some miners have termed it, "The smokeless powder".

Hercoal-F is replacing black and pellet powder in the coal industry because it costs no more for equal volume

and gives equal execution. It produces as good lump, is safer, has better fumes, practically no smoke, and is a permissible. It gives the greatly desired "cushioning" effect without the use of air-spacing. Hercoal-F gives the miners more working hours. It is the explosive the coal industry has always wanted. Write for complete information and prices.

For further information on other explosives and blasting supplies, see pages 298 to 301 of the 1929 Keystone Coal Mining Catalog.



HERCULES POWDER COMPANY 934 King Street
(INCORPORATED) Wilmington, Del.

Please send me booklet describing Hercoal-F.

Name.....

Company.....

Street.....City.....

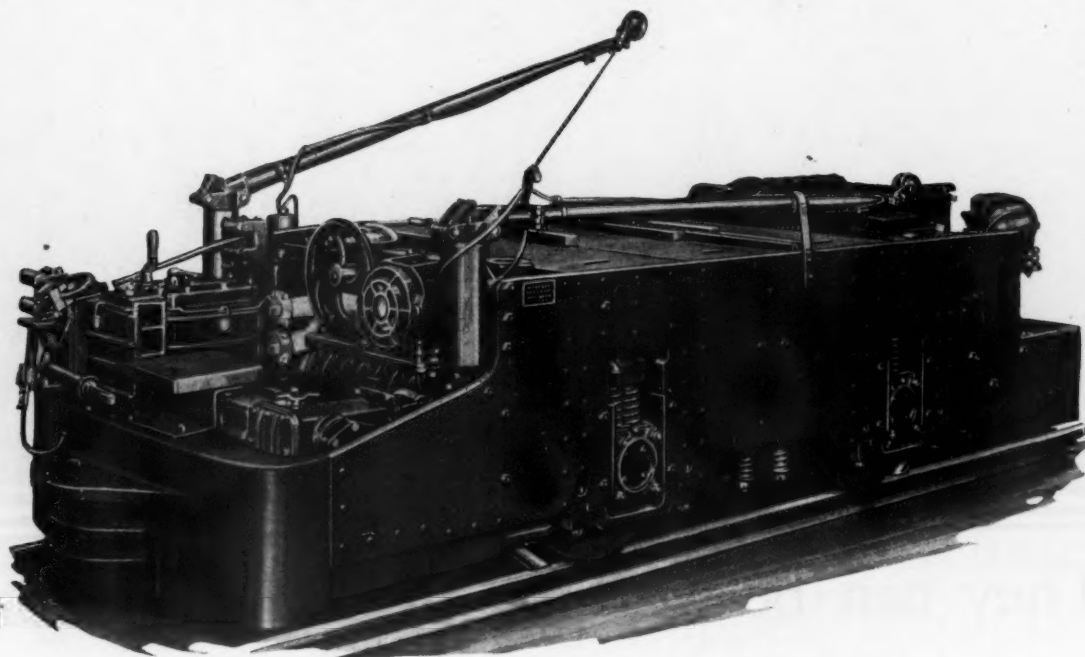
HERCOAL-F

Not Just One Feature—but MANY

Have Established the

Goodman Safety Gathering Locomotive

a Favorite for Gassy Mines



AN 8-TON GOODMAN SAFETY GATHERING LOCOMOTIVE

Slow speed motors. Semi-magnetic control. Alloy steel rheostat grids. Roller bearing axle boxes. Motor-driven electric cable reel, with 450 ft. of rubber-covered duplex cable. Transverse equalizer.

All electrical parts are enclosed in compartments proof-tested for internal explosions. Compartment covers close on machined tongue-and-groove joints—the Goodman Safety and Accessibility feature.

One of a fleet of nine, on its way to a large gassy mine in West Virginia, this locomotive will "stop over" at Cincinnati for exhibition in the Goodman space at the Mining Congress.

See there for yourself—first hand—the many
SAFETY and ACCESSIBILITY features
which have appealed to so many operators!

The GREATEST ADVANCE made in the Combination Trolley and Enclosed Cable Reel Gathering Locomotive is the Tongue-and-Groove method of closing electrical compartments, developed by the Goodman Manufacturing Company to assure Safety without sacrifice of Accessibility. Electrical parts on Goodman Safety Locomotives are as easily and completely accessible as those on the "open" type of reel-and-trolley gatherers.

*Be sure to see one of the new Goodman books, No. H-290, covering this Safety Locomotive and its features.
Get a copy at the Congress, or write for one.*

Not Mere Claims—but REASONS WHY Operators Install Goodman Slabbing Machines

They are Rugged

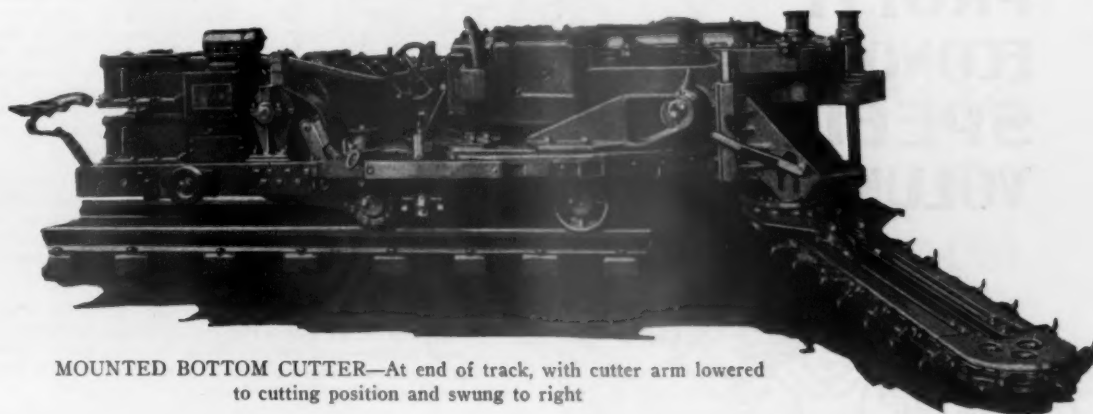
They are Safe

They are Easy to Operate

They Cut Lots of Coal

And—The Men Like Them Best

Goodman "Book No. 280" Shows the Features that Prove these Reasons Sound



MOUNTED BOTTOM CUTTER—At end of track, with cutter arm lowered to cutting position and swung to right

Cutter Arm swings on an elevating head, which head is supported on a turntable. The arm may be locked at any of seven different positions in its swing. Cutter chain is driven by a 50-hp. motor.

Cuts anywhere from 8 in. below the rail top to 8 in. above the rail top without increasing the overall height of the machine. When fitted with a 7-ft. undercut arm the machine will cut places as wide as 28 ft., or entries as narrow as 12 ft., or even less.

IT CUTS A SMOOTH FLOOR

The machine here pictured will be on exhibition in the Goodman space at the Mining Congress in Cincinnati.

They're Built to "Stand the Gaff" in Mine Service

This surpassing ability to DO Hard Work and Endure Severe Punishment has been a big factor in the phenomenal success of the Goodman Line of Slabbing Machines.

Get a copy of Book No. 280 at the Congress, or write us for one.

GOODMAN **MANUFACTURING COMPANY**
Locomotives - Loaders - Coal Cutters
 HALSTED ST. at 48TH.
 CHICAGO --- ILL.
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MAN-POWER *Multiplied*

Means:
**PROFIT
ECONOMY
SPEED
VOLUME**



Mr. John L. Lewis, president of the United Mine Workers of America, has expressed the opinion, according to an article in the Mining Congress Journal, that fair wages and higher standards of living are only possible by increased productivity per worker through progressive substitution of mechanical for human power.

With such assurance of moral support and cooperation from the mine workers themselves, what possible obstacle can any far-seeing operator find to prevent efficient mechanization of his production methods?

The record of more than 400 successful installations of the Cosco Conveyor System in American coal mines—not one of which has ever taken “time-off”—proves conclusively that good profits walk hand in hand with modern methods.

Cosco A-20 or B-15 Drives and Troughing, with improved flanged rollers, are profitably applicable to any coal mining condition including yours.

We shall welcome the opportunity to offer proof.

CONVEYOR SALES CO., INC.

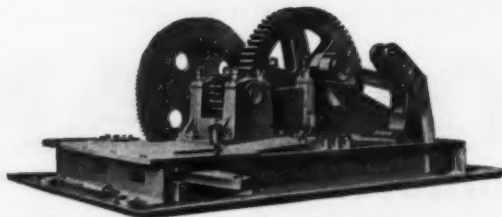
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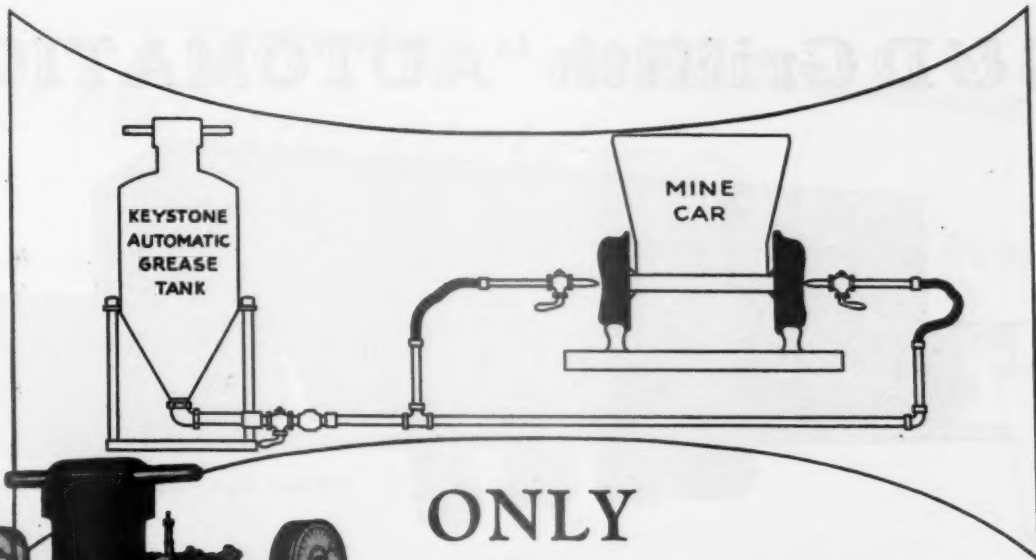


Shaker CONVEYOR

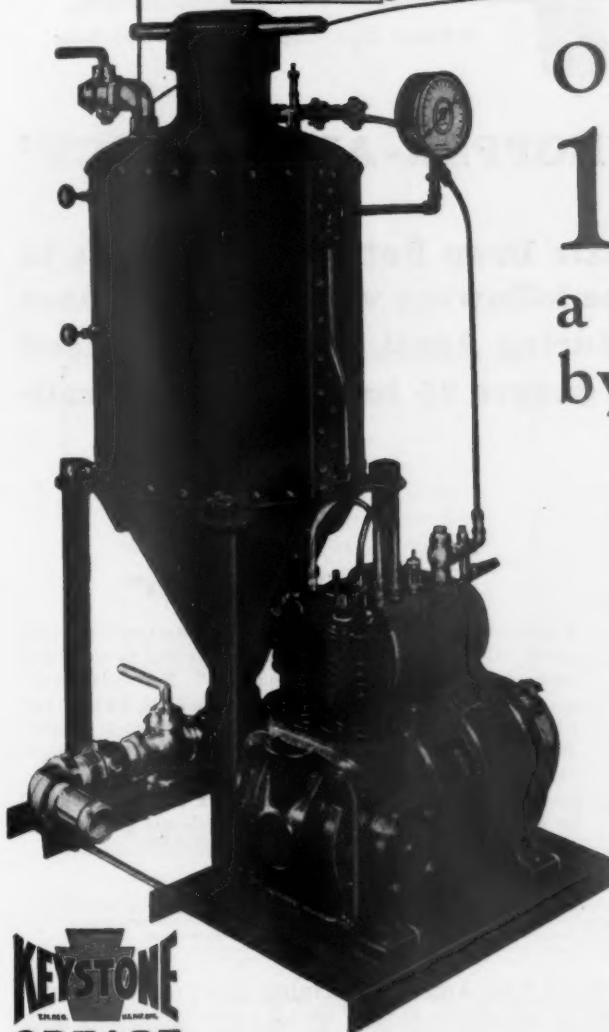


*“Convey
Your Coal
The
Cosco Way”*

COSCO
A-20 DRIVE
*The Perfected
Heavy-Duty Drive*



ONLY
15 seconds to
 lubricate
 a mine car wheel
 by this method!



KEYSTONE
 GREASE

PUSH the hose nozzle into the car wheel, press the valve lever, and in a few seconds the job is done!

So efficient is this new method that in one hour a man can do the work formerly requiring three or four. It was introduced at the 1928 convention. Several of the largest companies, seeing it there, ordered this machine for their various operations. In these mines the Keystone Pneumatic Lubricator, plus Keystone Grease, is effecting some very remarkable economies.

It can be used with practically every kind of mine car wheel plug because of the specially constructed Keystone nozzles.

Let us prove to you on your own cars that the Keystone System can save you money, time and trouble—and pay for itself in a short time.

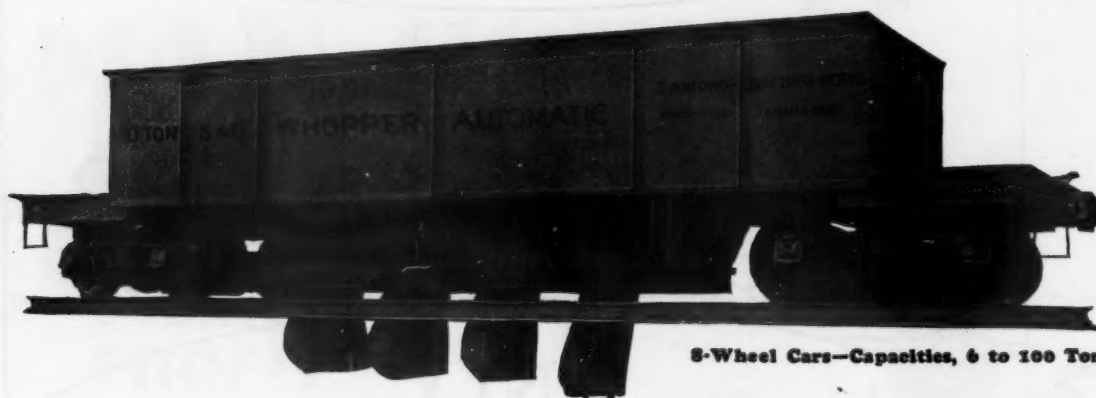
KEYSTONE LUBRICATING CO., Established 1884
 21st, Clearfield & Lippincott Streets, Philadelphia, Pa.

See it work at the convention

A Keystone Pneumatic Lubricator will be in operation at the Keystone Lubricating Company's booths, Nos. 268 and 269, National Exposition of Coal Mine Equipment, Cincinnati, Ohio, May 13th to 17th.

KEYSTONE
 PNEUMATIC SAFETY LUBRICATOR

S & D Griffith "AUTOMATICS"

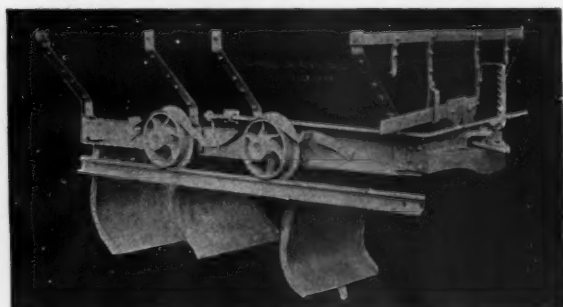


8-Wheel Cars—Capacities, 6 to 100 Tons

6 New Installations "WHOPPER-AUTOMATICS"

4 new installations, Big Automatic Drop Bottom 8-Wheelers in one week—2 new installations the following week at strip mines in Kansas, Illinois and Missouri during April. Capacities ranged from 15 tons to 35 tons. Track gauges 36 in. to standard railroad gauge.

S & D Griffith "Automatics"



4-Wheel Cars—Capacities, 1 to 20 Tons

4 Wheel "Automatics"

Numerous installations of these 4-Wheel "Automatics" every month. Old style mine cars are being discarded by many and replaced by Money-Saving "Automatics." New mines cannot afford to buy any other type cars. **TESTED, TRIED and PROVED** for 10 years, "Automatics" are the biggest Money-Making, Money-Saving Mine Cars yet built. Amazingly liberal buying plan whereby "Automatics" will pay you before you pay for them and leave you an extra big profit besides. Or we'll lease them to you on a rental basis and give you the privilege of buying at any time.

"Friendly old man Sanford-Day" will attend The American Mining Congress Convention May 13-17 in Cincinnati. See him at Music Hall, Booths 263, 264, 265 and 275, where he will exhibit and demonstrate "Automatics"—the most marvelous Money-Saving, Labor-Saving inventions of the age.

Sanford-Day Iron Works, Knoxville, Tenn.

We cut our costs **79** CENTS AN HOUR



AMERICAN
"TRU-LAY BRAND" WIRE ROPE

IMPORTANT PLEASE NOTE—8 Copies of All Service Reports are to be submitted Direct to

COPY No. 2. This Copy to be filed Alphabetically Under Equipment Designation.

Report No. 236
Date _____
District _____
Cust. Ord. No. _____
Mill Ord. No. _____

Name of Company a Pennsylvania Coal Company
Address _____
Where Used in strip mine
Name of Official in Charge of Test _____

SERVICE		Cost Per Service Hr.	Cubic Yards Excavated
Average Service	655	\$0.3417	76846
Maximum Service	899		90799
Average Service	225	\$1.1373	26826
Maximum Service	803		60803

TRU-LAY:

COMPETITOR'S

Name of Competitor's Rope _____

J-LAY 250' length Size 1 1/2" Construction _____ Grade I.P.S.

COMPETITOR'S 250' length Size 1 1/2" Construction _____ Grade I.P.S.

Type of Equipment Rope Used on (Give full description) Dragline shovel, electrically operated

Rope Used As (Give full detail) Dragline digging in coal

Signed _____

NOTE: Submit Diagrammatical Sketch On Reverse Side of This Sheet Showing Rope Reevings, Shave Groove and D-meters, Reverse Bends, etc.. Whenever Standard Equipment is Not Involved.

THE above service report shows what happened when Tru-Lay went on this dragline shovel job. It shows how Tru-Lay outperforms because it is preformed—costs less per hour of service.

Your name and address bring a sample.

AMERICAN CABLE CO., INC.
New York Central Bldg., 230 Park Ave.
New York, N. Y.

District Offices: Chicago, Detroit, Philadelphia,
Pittsburgh, Tulsa, San Francisco

An Associate Company of the
American Chain Co., Inc.

Dominion Wire Rope Company, Ltd., Montreal,
Sole Canadian Licensed Manufacturers

PREFORMED WIRE ROPE

TRADE **TRU-LAY** MARK



(Reg. U. S. Pat. Off.)

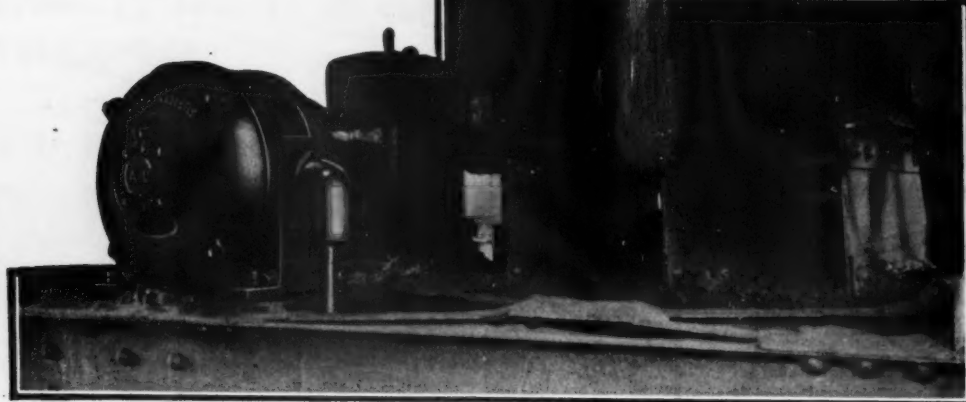


Sturdy Motors for your Tough Jobs

In every great industry, Allis-Chalmers motors have for years, proved their ability to handle the tough jobs as well as the easier ones. Endurance and all-around economy are to be expected of these motors built by a company known all over the world as makers of heavy duty power, electrical and industrial machinery.



Type AR 5 H.P.
Roller Bearing motor
driving shaker
screens.



Type AR 7 1/2 H.P.
Roller Bearing motor
installation on
reciprocating feed-
ers at the Berwind-
White Coal Mining
Co.

Another installation added to the list of prominent users is that of the Berwind-White Coal Mining Company, tippie No. 37, which is powered with Allis-Chalmers motors totaling over 950 H.P. Electric steel frames and indestructible rotors amply protect these motors from injury due to shock loads when used on shaker screens, crushers and other heavy duty tippie service. Timken Roller Bearings with their greater load area and thrust capacity shorten the shafts, multiply rigidity, and simplify the design.

In any type and in any service, Allis-Chalmers motors have piled up records for dependability and savings. They will serve you as well.

ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE

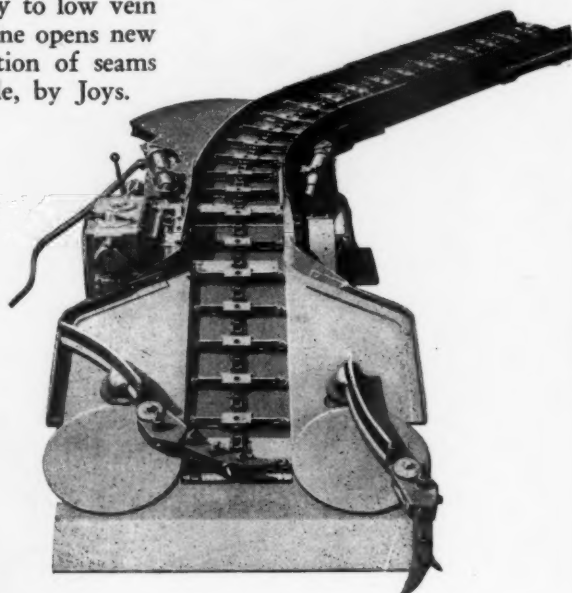
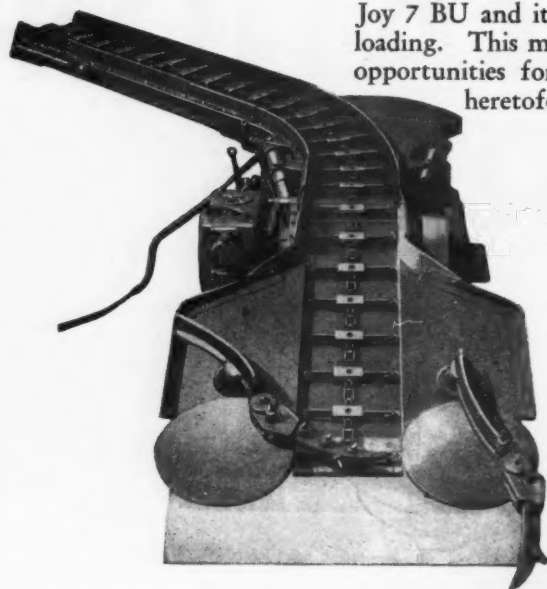
ALLIS-CHALMERS MOTORS

MECHANIZATION PROGRESS

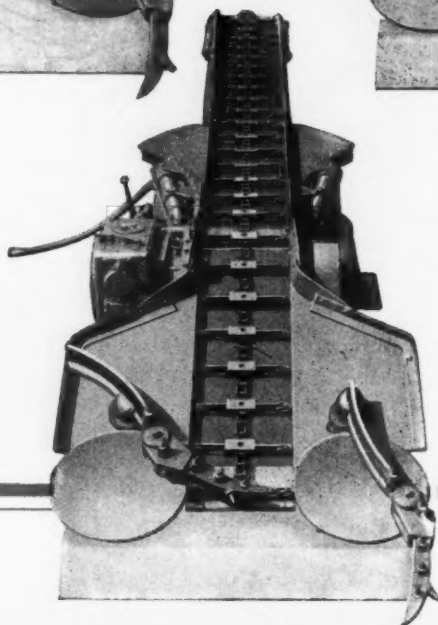


—and **Now** mechanize

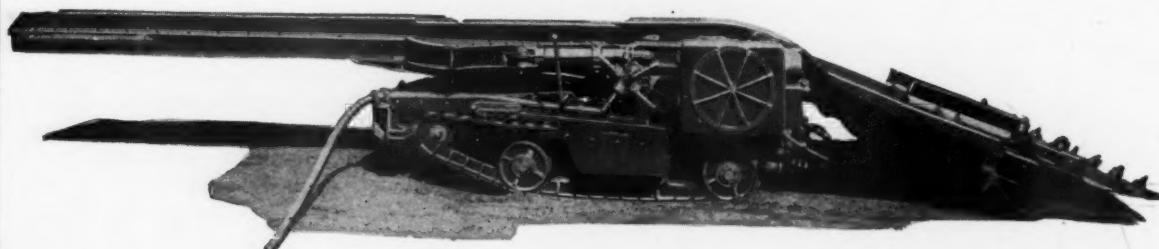
The two photos immediately below illustrate the flexibility of conveyor of the new Joy 7 BU and its adaptability to low vein loading. This modern machine opens new opportunities for mechanization of seams heretofore impossible, by Joys.



The Joy 7 BU has a single strand, universal link, roller flight conveyor which conforms to any flexed position of the conveyor trough.



Any degree of declination from zero to 45 degrees on either side of the machine is instantly available for discharging into pit cars or conveyors.



Low SEAM Mines with the JOY 7 BU—

Joy now offers a machine for low vein loading, one which is only 40 inches high when operating at face.

Joy Patented Gathering Mechanism is the same as used on all our underground machines, and with the exception of the conveyor is identical with all Joy Improved Type Loaders.

This new Joy is built in standard caterpillar track gauge—36 inch to 48 inch, and can be furnished with 250-500 volt D. C. and 220-440 A. C. electrical equipment.

It features a unique conveying mechanism which enables discharge end to be flexed through an arc of 45 degrees from center line in either direction.

As on all Joy Loaders, operations are controlled by single operator.

Guaranteed to load 2 tons a minute, Joy brings reduced costs to low seam operation by mechanical loading.

Investigate Joy for ultimate economy in low vein operations.

**Look for the JOY 7 BU
at Cincinnati**

Booth Nos. 279-280-281

The JOY Manufacturing Co.
Franklin, Penna.

SULLIVAN MECHANIZ

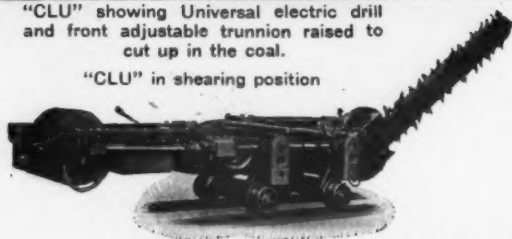


Sullivan "CLU" Machine undercutting in mine of Columbia Steel Corporation, Columbia, Utah.

Up-to-date Coal Mining with The "CLU" Track Cutter



"CLU" showing Universal electric drill and front adjustable trunnion raised to cut up in the coal.



"CLU" in shearing position

Overcutting, shearing, undercutting, drilling slate or coal, moving rapidly under its own power, the Sullivan "CLU" track cutter performs a modern mining job unequalled in adaptability, and low overall cost. It's work ideally prepares the face for mechanical loading.

"CLU" cuts nine feet deep in entries or rooms, to 25 feet in width. Two men handle it readily. The motor is 50 H. P. A. C. or D. C., open or Government approved type.

The "CLU" will be shown in operation at the Mining Congress. Don't miss it.

Ask for Bulletin 3782-E.

S U L L I V A N

TRADE MARK

Sullivan spare parts are carried in stock at the following points: Claremont, N. H., Scranton, Pa., Pittsburgh, Pa., Huntington, W. Va., Knoxville, Tenn., Birmingham, Ala., Michigan City, Ind., Terre Haute, Ind., St. Louis, Mo., Denver, Colo., Muskogee, Okla., El Paso, Tex., Salt Lake City, Utah, Spokane, Wash., Drumheller, Alta., Vancouver, B. C.

Boston
New York
Huntington
Birmingham

Pittsburgh
St. Louis
Knoxville

SULLIVAN MACHINERY COMPANY
808 WRIGLEY BLDG., CHICAGO

Terre Haute
Duluth
Denver
Muskogee
Spokane
El Paso
Salt Lake City

ED MINING EQUIPMENT



Cutter Bit Sharpener and Automatic Heater arranged for one-man operation



Sullivan 25 H. P. double drum hoist hauling scraper in a Scranton anthracite mine. (See cut below)

See These Modern Machines At the Mining Congress

Factory Methods in Bit Making. The scientific manufacture of cutter bits by machine was pioneered by Sullivan engineers several years ago. The Sullivan Cutter Bit Sharpener is built especially for this purpose and provides factory methods of bit sharpening for the individual mine or group of mines.

The savings in blacksmith labor, in bit steel, in power and in productive time at the face constitute outstanding economies which frequently pay for the machine the first year. **Bulletin 3772-M.**

(See the Sullivan Roller Bit Sharpener and automatic heater in actual service at the Mining Congress)

Efficient Scraper Loading. Mechanical loading with scrapers, pulled by Sullivan Electric Hoists is earning profits for many mines. The double drum, 25 H. P. and 35 H. P. units are well suited for either room or longwall service; smaller hoists (6½ to 15 H. P.) mounted on portable slides, are effective in entry work.

Single drum units in a variety of models are available for many car hauling tasks. **Bulletin 3776-J.**

Sullivan Hoists will be shown at the Mining Congress.

Can You Mine Longwall? The economies of long-wall mining are becoming more generally appreciated in many fields. Sullivan "Low-short" Ironclads (no higher than your Mining Congress Journal) enable you to realize Longwall economies to the full. "CLE-2" Ironclads are adaptable to any conditions. They stand foremost in cutting speed, power, ease of handling, and low operating cost. **(Catalogue 3782-D)**

See the "CLE-2" at the Mining Congress.

The Sullivan "Service of Supply" is organized to furnish complete machines, genuine Sullivan parts, or expert mechanical service on short notice when and where they are needed.

Scraper or scoop discharging coal into car in gangway in a Scranton anthracite mine



Fifteen Sullivan stock points are always ready to give "same day" shipment on mail, wire or 'phone orders. Insist on genuine Sullivan Repairs.

Algiers, Africa
Antofagasta, Chile
Brussels, Belgium

Honolulu, Hawaii
Iquique, Chile
Mexico City

Foreign Offices and Agencies:
Paris, France
Port of Spain, Trinidad
San Juan, P. R.
Santiago, Chile

Shanghai, Ch'na
London, England
Madrid, Spain

Manila, P. I.
Vancouver, B. C.
Wellington, N. Z.



Mancha's COALGETTERS for intelligent loading!

MANCHA'S Coalgetter not only makes a clean sweep but the sweepings are clean. It discriminates, it picks the wheat from the chaff because it permits intelligent loading. With the Coalgetter there is human intelligence between the cleaning and the sweeping, the picking and the loading.

Clean coal is what the trade must have and here is a machine that helps the operator meet that demand without the necessity of loading and hauling rock. Clean coal may be loaded at the face because, with the Coalgetter's efficient loading action is combined the brain of the miner. Operators all over the country are acknowledging the value of this combination—an efficient machine to load that permits the miner to use his intelligence and load clean coal.

By introducing the Coalgetter throughout his mine at unusually small expense the operator places his mine upon a mechanized basis immediately and retains the ability of the miner to load clean coal. Thus he gets clean coal, maintains his full tonnage with about half the number of diggers, pays full wages to the miners and procures his coal at a satisfactory cost.

This is very close to a complete solution of the Coal Mine problems which will lead to the ultimate stability of the industry.

*See our Coalgetters
Type A and B in op-
eration in Booth*

Nos. 28, 49, 50

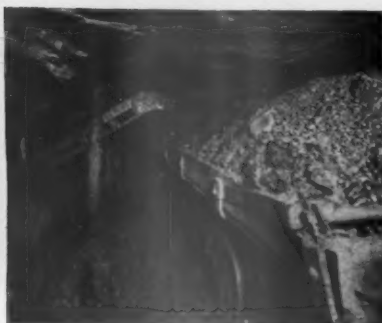
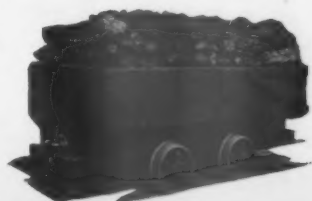
MANCHA STORAGE BATTERY LOCOMOTIVE CO.

1909 South Kingshighway Boulevard

St. Louis, Missouri



IN low veins or where conditions make rapid working imperative—in such places Lorain Sectional conveyors are opening up coal that has been inaccessible or impractical to work under slower development methods, as well as rendering more economical workings that were already started. These conveyors are unusually low—they are efficient and they are easily handled. Used with Langham Jacks for roof control and Lorain mine cars for haulage they make a combination that is difficult to surpass. See this equipment at Cincinnati — Booths 103 to 107. Let us study your problem — we will be glad to make recommendations and give quotations.



The Lorain Steel Company

General Offices: 545 Central Avenue, Johnstown, Pa.

SUBSIDIARY OF
UNITED STATES STEEL CORPORATION



Quality Products

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

CARNEGIE STEEL COMPANY
CYCLONE FENCE COMPANY
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY
ILLINOIS STEEL COMPANY
MINNESOTA STEEL COMPANY
NATIONAL TUBE COMPANY

THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & R. R. COMPANY
UNIVERSAL PORTLAND CEMENT COMPANY

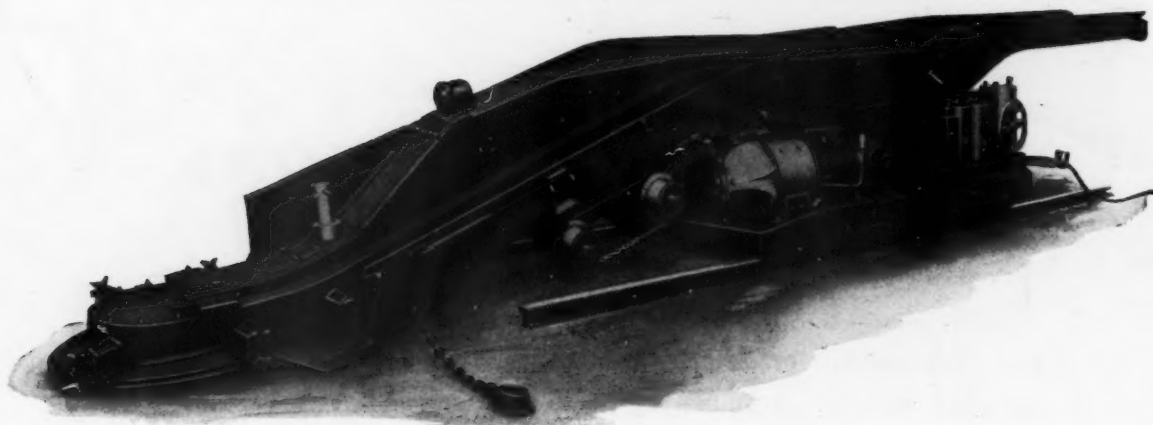
Dependable Service

Pacific Coast Distributors—United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle, Honolulu. Export Distributors—United States Steel Products Company, New York City

COLODER

Capacity & Economy

RECORDS



COLODERS HOLD ALL PERFORMANCE RECORDS FOR CAPACITY AND ECONOMY, as well as for endurance and reliability.

A group of 23 Coloders established these records for three years:

- (1) Average tonnage per shift, more than 300, of commercial coal;
- (2) Power consumption per ton, less than 3/10 kw-hr.;
- (3) Repair costs per ton, less than 3½ cents.

Coloders regularly load 3-ton cars in from 60 to 120 seconds.

A Coloder working off a pillar-butt loaded 110 tons in one hour.

Coloders regularly load from 300 to 450 tons every 8-hour shift.

Coloders in one entry, its air-course and breakthroughs, loaded 8,100 tons in one month.

Coloders in one company's mines loaded 1,500,000 tons in one year.

Coloders have loaded more than 12,000,000 tons within ten years.

No Coloder has ever worn out. No Coloder has ever been discarded. The first modern Coloder, placed in service in 1918, has loaded full tonnage daily for 11 years and is still going strong.

More than a decade of continuous service has proved the *record* capacity, reliability, economy, and endurance of the Coloder.

THE COLODER COMPANY, INCORPORATED

568 North Fourth Street

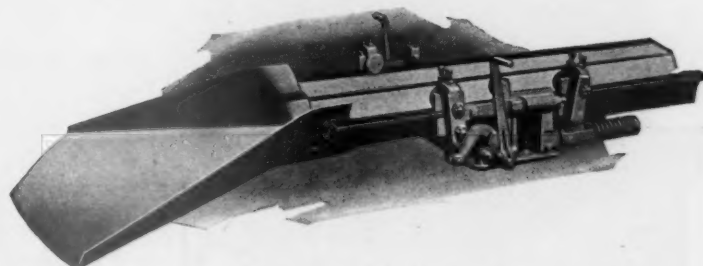
Columbus, Ohio, U. S. A.

"IT STAYS ON THE TRACK!"

The Universal and Shaker Loader *Duckbill*



COME AND TALK TO THE MEN WHO
INVENTED THE "DUCKBILL"
BOOTH No. 7—AMERICAN MINING
CONGRESS EXPOSITION

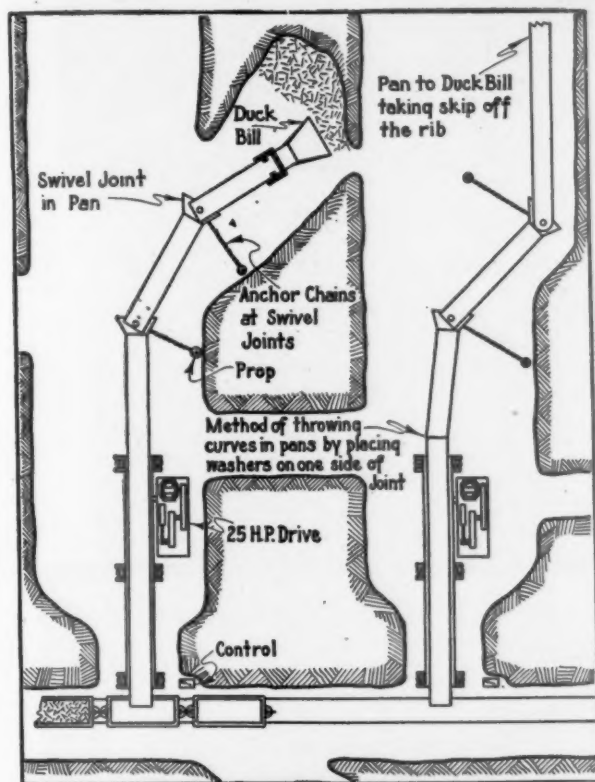


Universal in Its Application

THE Universal Shaker Loader when attached to a Shaker Conveyor, is adaptable to any mining condition. It will handle material, coal or rock, in seams of a height of but 24 inches and on pitches ranging from minus 5 per cent to plus 50 per cent. The maximum lateral clearance required is but 36 inches, thus permitting closer spacing of timbering than any other coal loading machine. It will work successfully where the maximum timbering (even lagging) is required. It will drive its own development work, advance rooms and recover room and entry pillars; or it can be used where the modified long-wall face method is employed.

Simple to Operate and Easily Maintained

THE Universal Shaker Loader is simple and sturdy in construction, requiring a minimum of maintenance expense. The operation is likewise very simple requiring but moderate physical effort. Any competent mine laborer can be trained to use the "Duckbill" successfully in a few hours' time.



PLAN VIEW OF TYPICAL OPERATION

(Address the Company or any of our Distributors)

ELEVEN PATENTS GRANTED AND PENDING IN U. S. A., CANADA AND EUROPE

ROCK SPRINGS LOADER CO.

Conveyor Sales Company, Inc.,
299 Broadway, New York

C. H. McCullough Engineering
Co., Oliver Bldg., Pittsburgh,
Pa.

ROCK SPRINGS
WYOMING

Sole owners and
manufacturers

Peacock Brothers, Ltd.,
Montreal, Canada

The Vulcan Iron Works Co.,
Denver, Colorado

MYERS-WHALEY SHOVELING MACHINES

*"The All-around Loaders
for Underground Work"*



LOADING COAL



LOADING HARD ROCK

A MYERS-WHALEY SHOVEL

will be in operation at Cincinnati May 13th-17th in Space No. 12-13-14 of the Mining Congress Exposition at Music Hall.

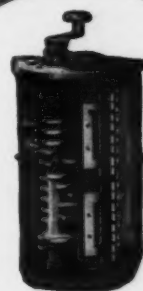
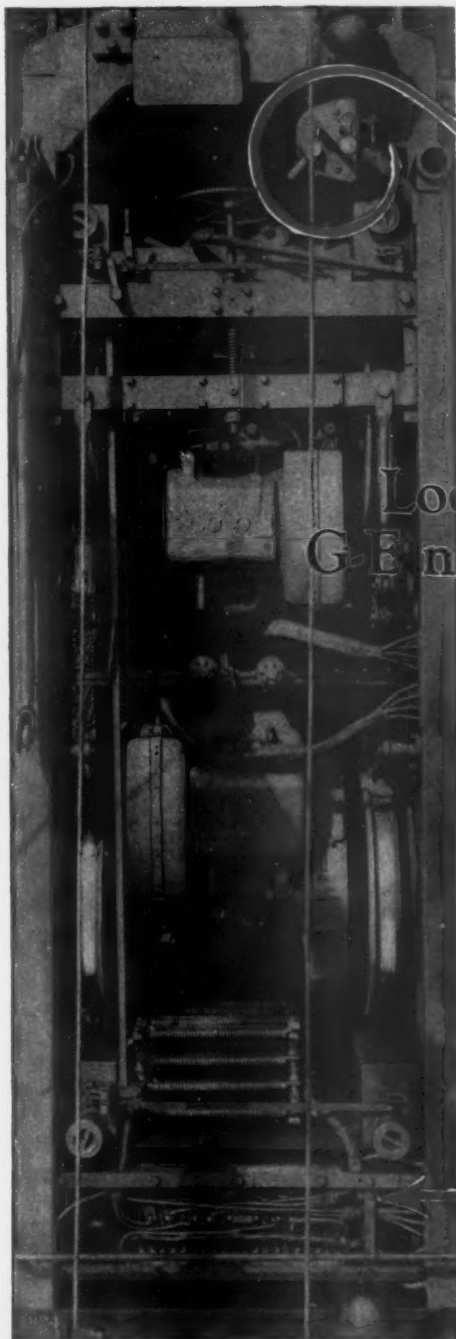
This is the machine that has made possible the economical and speedy Brushing of Entries, Loading of Roof Falls, Opening up Old Workings, Grading of Haulage Ways, etc., and has set the pace in Loading Coal in Entry Driving, also in Hard Rock Tunneling, etc.

To quote a Tunnel Builder—"For speed and general reliability we found none to compare with Myers-Whaley."

We shall hope to see you at our Exhibit.



*MYERS-WHALEY COMPANY, Knoxville, Tenn.
Manufacturers of Underground Loading Machines for Over 16 Years*



Master controller positively opens and closes contactors; its small size gives the operator more cab room.

Look into the control of G-E mine-haulage locomotives

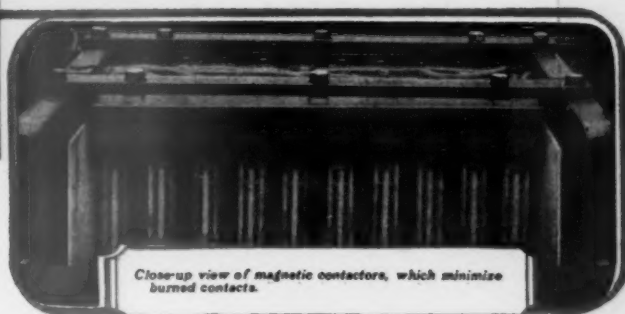
Examine the series-parallel, magnetic-contactor control of the G-E mine-haulage locomotive—and you'll understand its success in the field.

Move the control handle, and contactors open and close with no destructive arcing at contacts.

Every operator knows what that means—low maintenance costs—maximum use of the locomotive.

Add to these advantages great starting ability, low power consumption, ease of operation, non-breakable resistor, electrically reset overload relay, and maximum cab space, and you have the reasons why this control is standard on this type of locomotive.

Your G-E office will gladly give you complete information.



Close-up view of magnetic contactors, which minimize burned contacts.



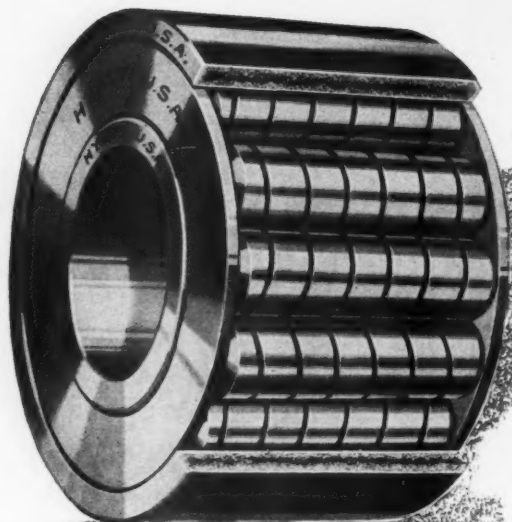
GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

360-42

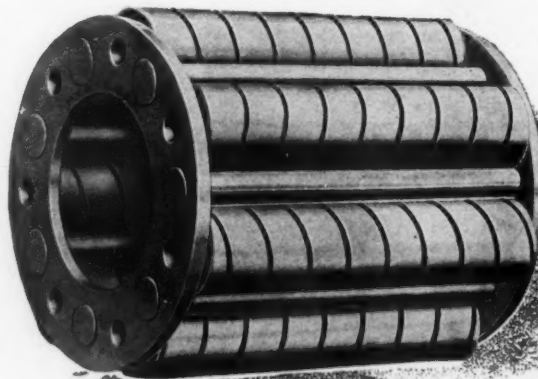


More Tons



The High Duty Hyatt Roller Bearing is recommended for use where space is limited and speeds are high. The close limits to which all parts of this type bearing are held make possible the advantageous use of the maximum number of rollers. This accounts in part for their high carrying capacity and long life.

The split outer race type bearing provides efficient and economical solution of the bearing problem where speeds are less than 1,000 R.P.M. where economy of space is not a prime consideration, and where the requirements of accuracy approximate those of commercial shafting.



Mining
Congress

Hyatt Roller Bearings in mine cars use but 20% of the lubricant and lubrication time required for old-fashioned bearings.

Per Dollar



with Hyattized Equipment

GATHER in the facts concerning profitable mining. Boil them down. Your conclusion—like that of other operators—will be this:

The index of profits lies in car efficiency.

Car efficiency depends on reliability of running gear.

To be reliable, running gear must have the proper bearings.

Thus is indicated the use of Hyatt Roller Bearings. They are logical for mine car use—have been for twenty-one years. In that period cars have undergone transformation, methods of mounting have changed, but the sturdy simplicity, the husky durability, the correct design of Hyatt Roller Bearings have needed no

change. Every day their carefree, easy rolling operation is helping pile up low cost tonnage for modern-minded mines.

To other equipment also—conveyors, crushers, pulverizers, fans, motors, and mine locomotives—Hyatt brings dependable efficiency. Whatever the application, you can assure yourself the utmost in bearing performance by providing for Hyatt Roller Bearings.

For mine cars Hyatt Roller Bearings can be had in journal box or in wheel mountings. Most manufacturers can furnish Hyatt equipped cars and running gear. Simply specify "to be equipped with Hyatt Roller Bearings" on your next order.

HYATT ROLLER BEARING COMPANY

NEWARK CHICAGO PITTSBURGH DETROIT OAKLAND

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

Space
No. 38



New a.c.f.—Any Capacity—Automatic Drop Bottom Hopper Car

For Stripping and Quarrying Operations

Here's a way to cut your tonnage costs—with a car designed for the purpose.

One of the most successful coal stripping operators has reduced haulage costs to a minimum by standardizing on these new a.c.f. cars.

If you operate a strip mine then you will want to know more about these new cars. If you are not a strip mine operator you are interested in knowing how some companies are getting tonnage at an extremely low cost.

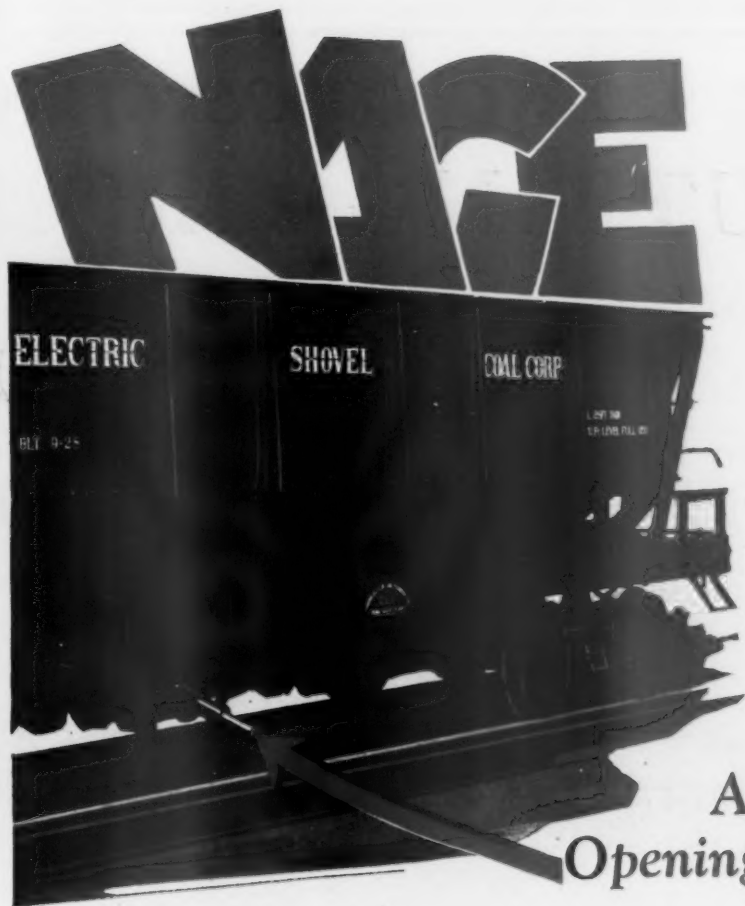


MINE CARS
MINE CAR WHEELS
MOTOR WHEELS

PINS AND LINKS
MINE CAR TRUCKS
CAR IRONS

BARS, IRON AND STEEL
BOLTS, NUTS, RIVETS
FLANGED PIPE

IN THE SERVICE OF THE NATION'S RAILWAYS, HIGHWAYS, WATERWAYS, INDUSTRIES



Automatic Control
Opening and Closing Doors



AMERICAN CAR AND FOUNDRY COMPANY



New York
Berwick, Pa.

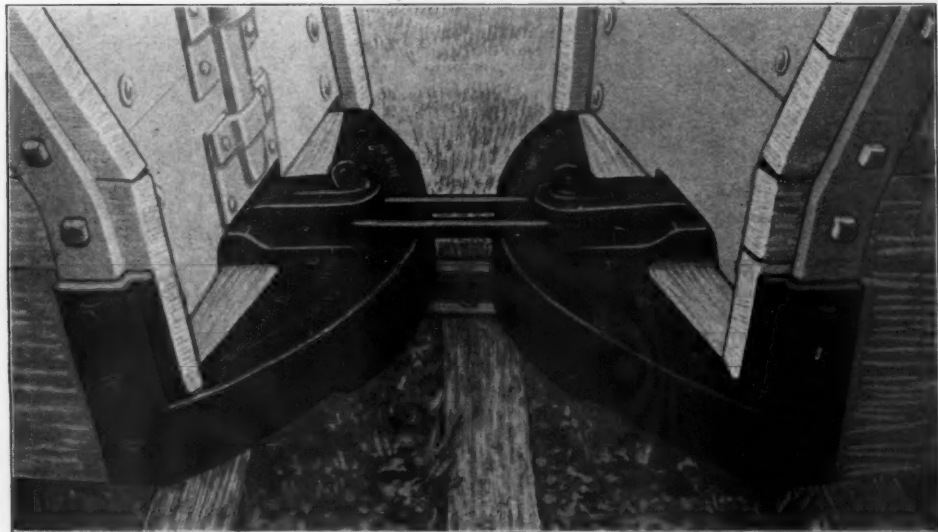
St. Louis
Bloomsburg, Pa.

Chicago
Huntington, W. Va.
Buffalo, N. Y.

Pittsburgh
Terre Haute, Ind.

IN THE SERVICE OF THE NATION'S RAILWAYS, HIGHWAYS, WATERWAYS, INDUSTRIES

**YOU'RE GOING TO CINCINN
CUTTING PROD
SEE THESE
BONNEY - FLO
THEY ARE REAL CO**



**ONE PIECE
CAST STEEL**

**BONNEY - FLOYD
MINE CAR BUMPERS**

**WITH REPLACEABLE
DRAW BAR TONGUES**

These Bumpers will

- | | |
|--|---|
| 1. Reduce your costs and repairs. | 6. Make weak ends strong. |
| 2. Give longer life. | 7. Make new and better cars out of your old ones at small cost. |
| 3. Stop leaks at the end gates. | 8. Reduce number of cars necessary by keeping them in service for longer periods. |
| 4. Prevent derailments. | |
| 5. Tie the whole end of the car together. | |
| 9. Prevent a large percentage of bent axles. | |

Write for full particulars, sending, if possible, a blueprint of your cars.

THE BONNEY-F
COLUMBUS,

ATI TO GET IDEAS ABOUT DUCTION COSTS

YD PRODUCTS

IN BOOTHS 21-22-55-56

ST REDUCERS

BONNEY-FLOYD MINE CARS

HAUL 20-100% MORE COAL THAN OTHER TYPES OF
THE SAME OVER-ALL DIMENSIONS.

THEIR LIVE LOAD RATIO ENABLES THE HAULAGE
OF *A GOOD PERCENTAGE OF COAL FREE.*

THEY ARE EQUIPPED WITH *CAST STEEL SPRING
DRAWBAR - BUMPERS AND SPRING JOURNAL BOX
MOUNTING IF DESIRED.*



FLOYD COMPANY

OHIO



It would take a book!

TO TELL about the advantages of Phillips Open Cap Wheel Trucks, and the service they have been giving for more than 20 years. Never before has any style of running gear been so widely used for re-trucking old cars.

The reason? Real operating economy. Open Cap Wheels are averaging 11 to 12 years service life, on long hauls and steep grades, at high speeds and under heavy loads—all the varying conditions of mining service.



Look at the photograph of the old wheel. This was cast 1/8/09, used at a busy mine, and removed in March, 1928. The bore of a new wheel is no rounder or truer than the bore of this veteran, which shows no detectible wear after more than 18 years service.

A hard-to-beat combination for economical operation is Phillips Cars and Phillips Wheels, whether Open Cap, Plain or Roller Bearing—all are as good as can be made.

Read about
this veteran
of 1909

PHILLIPS

MINE and MILL SUPPLY Co.

Mine Cars—Running Gear—Plain and Roller Bearing Wheels—Tipple Equipment—Car Dumps—Gravity Rotary Dumps—Screen Bars—Screens

PITTSBURGH, PA., U. S. A.

No. 3A

Bethlehem Mine Tie
Weight of tie section
3.24 lbs. per foot
At right

No. 3

Bethlehem Mine Tie
Weight of tie section,
4 lbs. per foot
Below

No. 2

Bethlehem Mine Tie
Weight of tie section,
2.40 lbs. per foot
Above at right

No. 1

Bethlehem Mine Tie
Weight of tie section,
1.33 lbs. per foot
Above at left



Bethlehem
Keystone
Metal Tie
At left

FROM FACE TO TIPPLE

No other single factor has greater bearing on the cost of mining and on output than the haulage ways. And, to a large extent, the safety and efficiency of the haulage ways depend on the ties.

For years Bethlehem Steel Mine Ties have been giving good service in the haulage ways of hundreds of mines, including properties of the large, low-

cost producers. You can use Bethlehem Ties anywhere in the mine with confidence. They have the rugged strength to stand up through years of hard service.

There is a Bethlehem Steel Mine Tie of the proper size and weight for every location in the mine, from face to tipple. Descriptive bulletin sent on request.

The Bethlehem (Keystone) Metal Tie is especially designed for service on main haulage ways. It is manufactured for all gages of track and all weights of rail. The whale-tail end, shown above, securely grips the ballast.

The heavy tie plates and rolled steel clips firmly clamp the rail to the tie at the correct gage, making gage rods unnecessary. The tie plates are slotted lengthwise, permitting the bolt which holds the clip in place to be removed from the top without disturbing the tie or ballast, thus facilitating easy removal of the rails.



Bethlehem Steel Mine Ties, including the Bethlehem (Keystone) Metal Tie, will be shown in the Bethlehem Exhibit at the American Mining Congress Exhibition, Cincinnati, Ohio, May 13th to 17th, Booths 297 to 305.

BETHLEHEM STEEL COMPANY, General Offices: Bethlehem, Pa.

District Offices:

New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland and Honolulu.
Bethlehem Steel Export Corporation, New York, Sole Exporter of our Commercial Products

BETHLEHEM

TIES FOR EVERY LOCATION IN THE MINE



MODERN
But Not Shocking

293 **BOOTHS** **294**
NATIONAL EXPOSITION
COAL
MINE EQUIPMENT
CINCINNATI MAY 13-17

Come take a peep at a new wrinkle, on mine cars

Enterprise Wheel & Car Corporation
Bristol, Va.-Tenn. Huntington, W. Va.

Sales Agents

Birmingham
A. J. Bowron

Bluefield
F. G. Phillips

Denver
O. H. Davidson

Hazard
Sterling Hardware Co.

Middlesboro
Rogan & Rogan Co.

ENTERPRISE
Mine Cars and Roller Bearing Wheels



SAFETY AND PERFORMANCE

The Atlas Storage Battery Locomotive has been approved by the United States Bureau of Mines for use in gaseous mines. It is safe so far as human foresight can make it safe.

No sacrifice of the high performance qualities for which the Atlas Locomotive is noted was necessary to make it safe. These performance qualities actually were improved.

"Atlas Does Haul More Coal"

with a smaller expenditure of battery power than any other locomotive.

It is *never* necessary to change batteries during the working shift in gathering service when using Atlas Permissible Locomotives.

Pond Creek Pocahontas Company at Bartley, W. Va., will tell you things about this machine which are surprising.

An A. C. Nielsen Co. survey gives authentic details.

The Atlas Car and Manufacturing Co.

Engineers

CLEVELAND, OHIO

Manufacturers

ELECTRIC AND STORAGE BATTERY CARS FOR EVERY HAULAGE REQUIREMENT.
SCALE CARS—TRANSFER CARS—CONCENTRATE CARS
COKE PLANT MACHINERY



TROUBLE-FREE, THEY ROLL ALONG

IN 1919 a Kentucky company purchased 250 Hockensmith cars—1000 wheels. In the ten years intervening, only *six wheels* have been purchased for replacement. Twelve years ago a West Virginia colliery purchased 400 wheels, and two years later an additional 160. Only 48 wheels have been purchased for replacement.

These are but two of dozens of instances which could be quoted to testify to the amazing number of trouble-free ton-miles of service built into Hockensmith wheels . . . service that, as in all Hockensmith equipment, cuts costs, speeds production, helps to realize for the user a high ideal of efficient haulage. When you're in the market for mine-car equipment—let Hockensmith quote.

**EFFICIENT
HAULAGE**

HOCKENSMITH WHEEL & MINE CAR CO.

Penn, Pa. Long Distance Phone, Jeannette 700

SALES REPRESENTATIVES

Huntington, W. Va.—Huntington Supply & Equipment Co. Knoxville, Tenn.—Webster & Co.
Clarksburg, W. Va.—Mr. Norman Strugnell Chicago, Ill.—W. W. Baker, 140 So. Dearborn St.

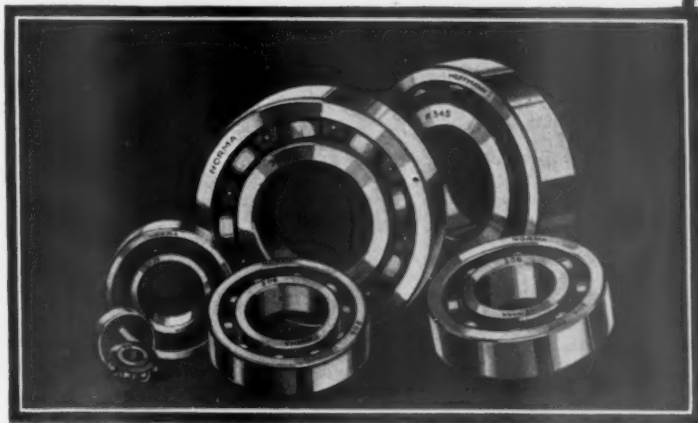
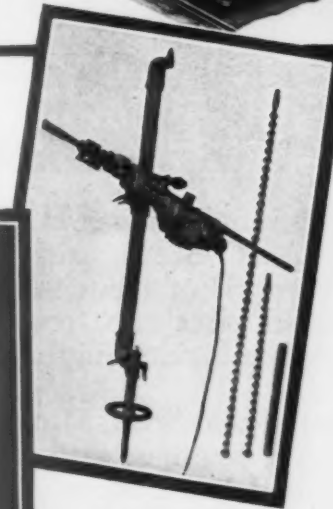
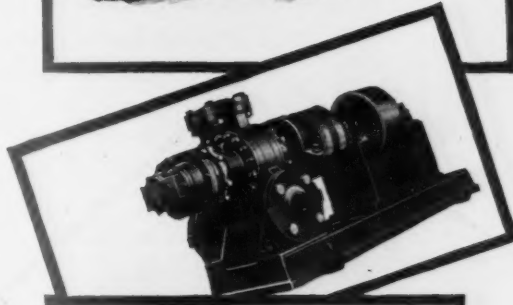
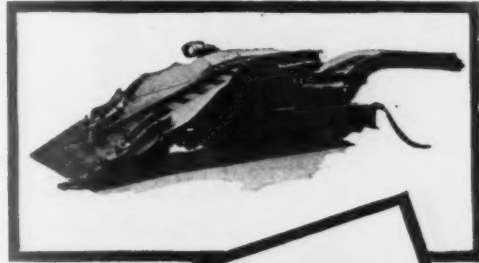
MODERNIZE! *mechanize!*

THUS is the progressive trend of the mining industry. And in the same spirit, anti-friction bearings must logically be chosen for their superior efficiency.

NORMA-HOFFMANN BEARINGS appeal to discriminating designers for their inherent precision, rugged design and unfailing dependability. A complete line of ball, roller and thrust bearings offers endless possibilities for improved service in mining equipment.

Our representatives at the Mining Congress Exhibit in Cincinnati, (Booths 290-291) will be glad to discuss your bearing problems with you.

If you can't get to the Show write for three folders just issued on NORMA-HOFFMANN BEARINGS in Mining Machinery and for our Engineering Data Sheets No. 917.



N-989

The machines shown here and others of many varied kinds owe their dependable performance to their makers' choice of NORMA-HOFFMANN Bearings for vital service.

NORMA-HOFFMANN PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.

National

The

"National" line of Mine Car Equipment
will insure better service, greater strength,
and speedier operations



The Willison Mine Car Coupler meets the requirements of either individual or multiple car dumping. These couplers will remain coupled when turned upside down, or they may be tripped and recoupled automatically if desired. Willison couplers are stronger in proportion to weight than other automatic couplers.

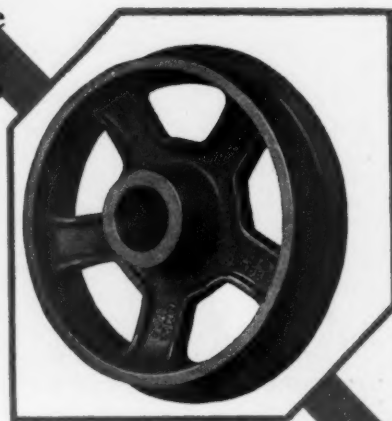


See these at
BOOTH No. 77

American
Mining Congress

"National" Swivel Hitchings are made of NACO Steel, and have an ultimate strength of from 90,000 to 100,000 lbs. Stock sizes run from 10 inches to 19 1/2 inches inside length.

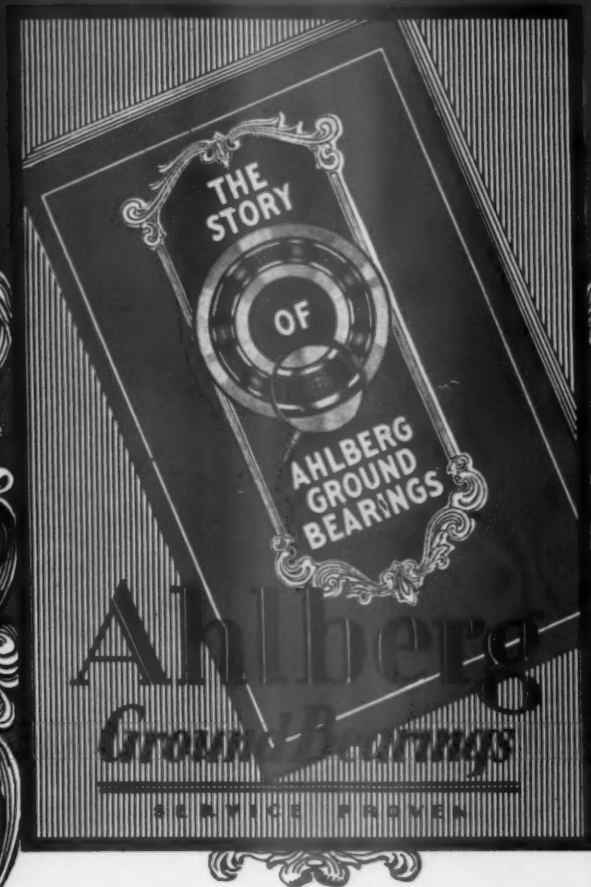
"National" Naco Steel Mine Car Wheels are lighter, stronger and more durable than chilled cast iron wheels, and eliminate the likelihood of tread spawling and flange breakage. We can furnish Naco Mine Car Wheels in all sizes regularly used.



Write for Circular No. 87

NATIONAL MALLEABLE AND STEEL CASTINGS CO.
General Office—Cleveland, O.

National



THE Story of Ahlberg Ground Bearings reveals such a consistent economy that every coal mine man with bearing replacement problems should read it. He'll save 40% on his next bearings if he does.

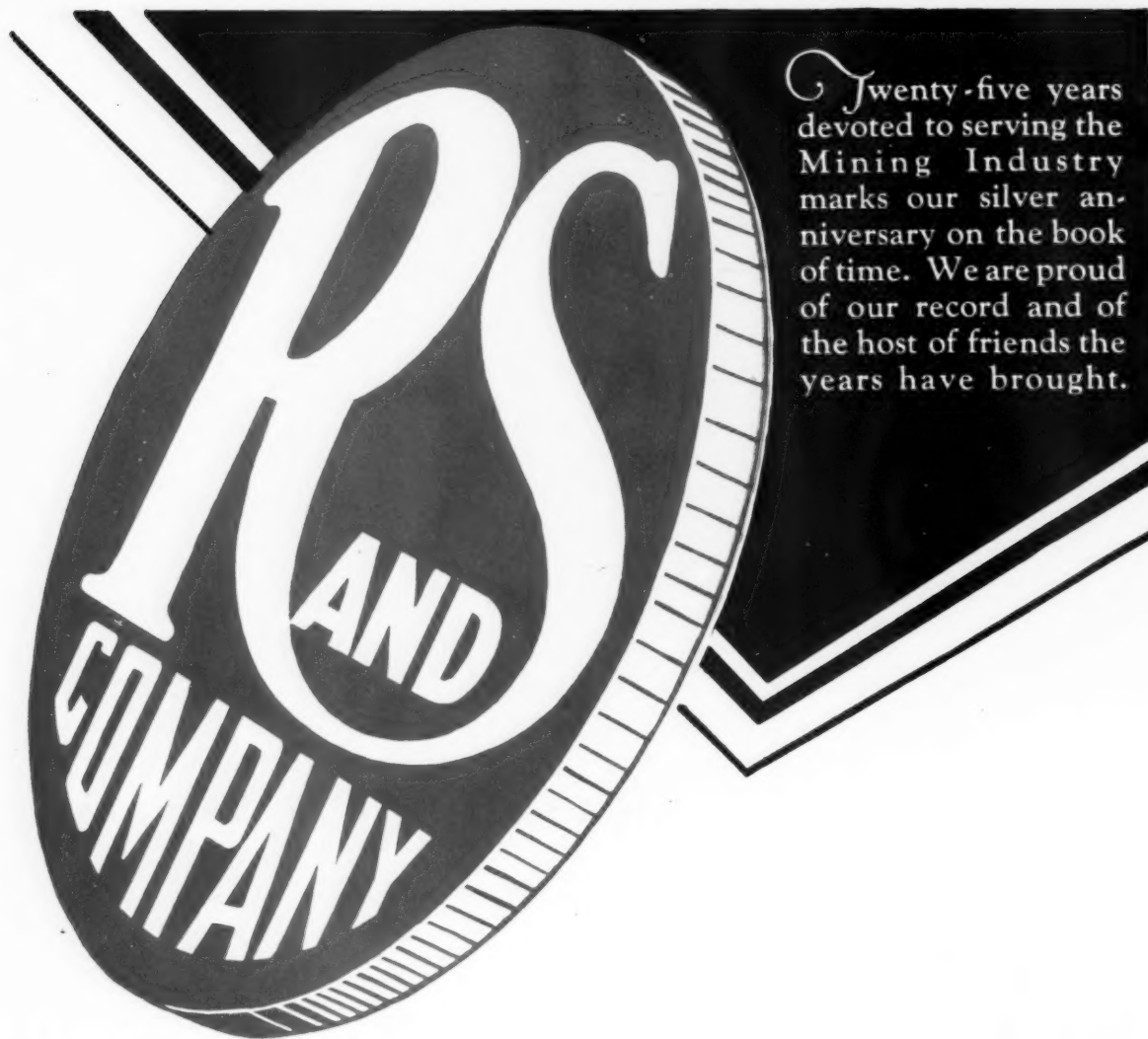
Visit the Ahlberg Booths at Cincinnati, or write direct to any of the following distributors for your copy of "The Story of Ahlberg Ground Bearings."

BECKLEY, W. VA.
Beckley Machine & Electric Co.
MORGANTOWN, W. VA.
Monongahela Supply Co.

NORTON, VA.
Norton Supply & Equipment Co.
LOTHAIR, KY.
Mine Service Co.



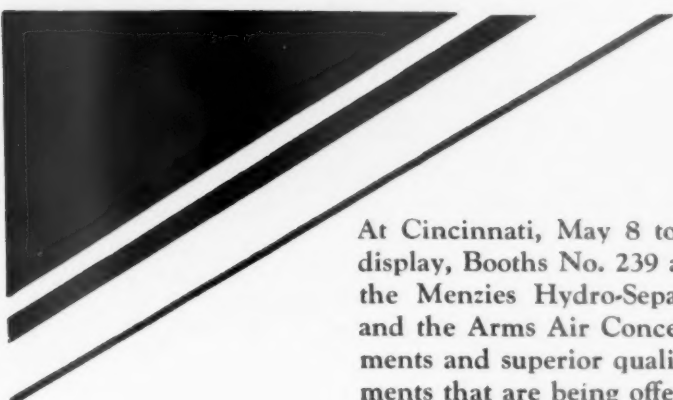
Booths 1 and 2 at CINCINNATI



Twenty-five years devoted to serving the Mining Industry marks our silver anniversary on the book of time. We are proud of our record and of the host of friends the years have brought.

The Coal Mining Industry has accepted RandS Methods in coal cleaning, preparing and handling equipment. More than 1300 contracts have been erected during the past twenty-five years.

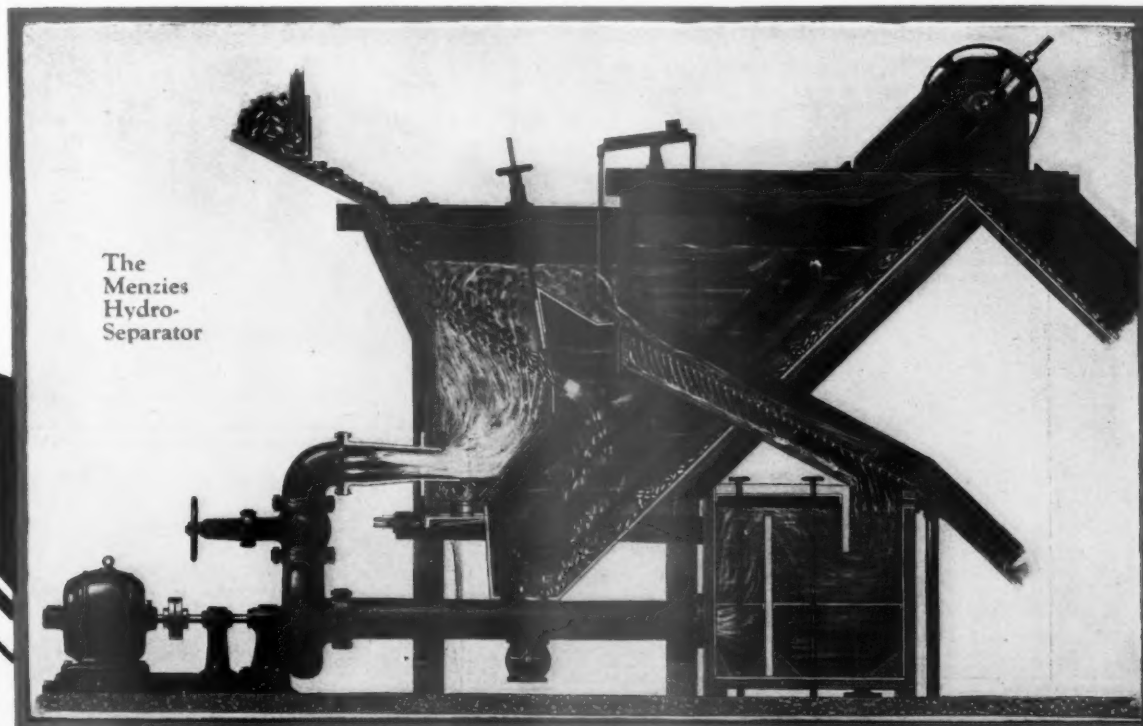
This twenty-five year period is a true testimonial to our constant endeavor to produce for our users highest efficiency methods of maximum operating economy, plus safe, fool-proof designs and a ruggedness to withstand the most severe service. To this also can be added the uniqueness of RandS Design for allowing inexpensive changes in equipment as required by the ever-changing demand for cleaner, better graded coal. These, then, are the reasons why you should employ the services of RandS Engineers.



At Cincinnati, May 8 to 17, RandS Equipments will be on display, Booths No. 239 and No. 240. Be sure to investigate the Menzies Hydro-Separator, the Arms Vibrating Screen and the Arms Air Concentrating Table. Note the improvements and superior qualities of these units over other equipments that are being offered for the economical wet and dry cleaning of coals.

And don't forget to ask for a copy of the Roberts and Schaefer Twenty-Fifth Anniversary Booklet No. 118. It contains a complete display of the newest and most improved methods of handling, preparing and cleaning coal—it illustrates some of the largest and most modern tipples and cleaning plants of the present day—it is a history of the past twenty-five years of our service to your Industry. Copies are free on request.

If you do not attend the Convention, be sure to write for your booklet. We will gladly forward it to you.



ROBERTS AND SCHAEFER CO.
ENGINEERS and CONTRACTORS

PITTSBURGH, PA., 418 OLIVER BLDG. WRIGLEY BUILDING, CHICAGO. HUNTINGTON, W. VA., 514 NINTH AVE.

KOPPERS

*An organization equipped
cilities to accept full responsibility
operation of coal cleaning plants*

Modern Coal Cleaning Plants represent a gilt-edged investment in the preparation of clean quality coal—a coal that will always be in preferred demand. Coal Washing Plants also represent a big engineering job—a job requiring the combined skill of an entire corps of engineers to solve the complexities of technical details.

Think then, of the *convenience* of turning over to *one* company the entire responsibility for the successful design and construction of a Rheolaveur Coal Cleaning Plant. It simplifies negotiation, centralizes the responsibility and takes the whole burden of details out of your hands.

The Koppers-Rheolaveur Company offers you just such a service—an organization amply financed and completely equipped to follow the job through from preliminary survey to completed plant.

For more complete information on the Rheo Process see pages 49 to 53 in the latest Keystone Coal Mining Catalogue.

KOPPERS-RHEOLAVEUR COMPANY

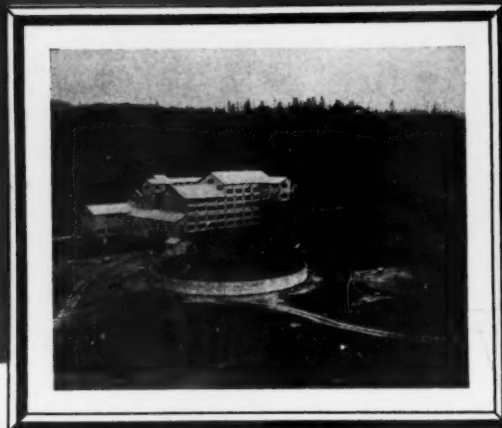
KOPPERS BUILDING · PITTSBURGH, PA.

SALES OFFICE AND LABORATORY
COAL EXCHANGE BUILDING
WILKES-BARRE, PENNA.

SALES OFFICE
120 BROADWAY
NEW YORK CITY



Champion Cleaning Plant
PITTSBURGH COAL CO.



Black Diamond Washery
PACIFIC COAST COAL CO.

RHEOLAVEUR

*by engineering personnel and fa-
for the design, construction and
of any size or capacity* ❧ ❧ ❧ ❧

These representative operators
are using the Rheolaveur Process

Glen Alden Coal Company American Smelting and Refining Co.

Pittsburgh Coal Company Lehigh Valley Coal Company

Koppers Coal Company Pacific Coast Coal Company

Hudson Coal Company Lehigh Coal and Navigation Company

The Great Valley Anthracite Corporation

Visit our Exhibit in Booths Nos. 8 and 9, South Hall, at the
American Mining Congress, Cincinnati, May 13th-17th.

Coke Works
AMERICAN SMELTING AND REFINING CO.



Washer Cleaning Plant
PITTSBURGH COAL CO.

DUST SIZING

WITH THE



"PNEUMO-GRAVITY SYSTEM"

ADVANTAGES OF PEALE- DAVIS SYSTEM

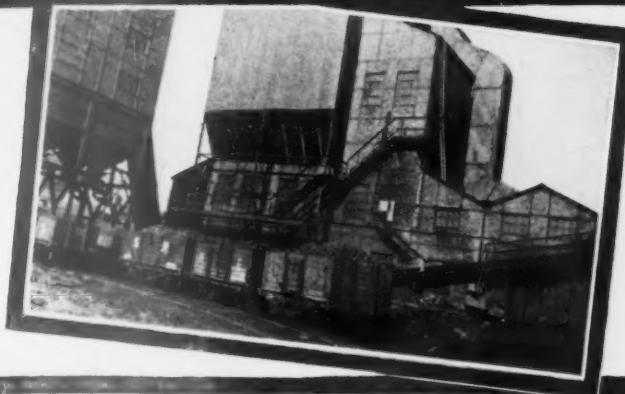
1. Dry washing without pre-sizing. (6" to dust.)
2. One primary table of large capacity. (25 to 300 tons per hour dependent upon design.)
3. One secondary or retreatment table, minimizing coal loss.
4. Simple dust collecting system without the use of mechanical means, which successfully controls dust laden air. (Less dust due to non-sizing.)
5. Elimination of multiple screening units and, therefore minimization of coal breakage.
6. Elimination of multiple tables.
7. Minimization of coal freezing in railroad cars.
8. Low installation cost.
9. Low power and labor costs.
10. Low maintenance cost.
11. Small floor space.
12. High recovery and maximum refuse removal.

Testing plant and Engineering Offices located at St. Benedict, Penna.

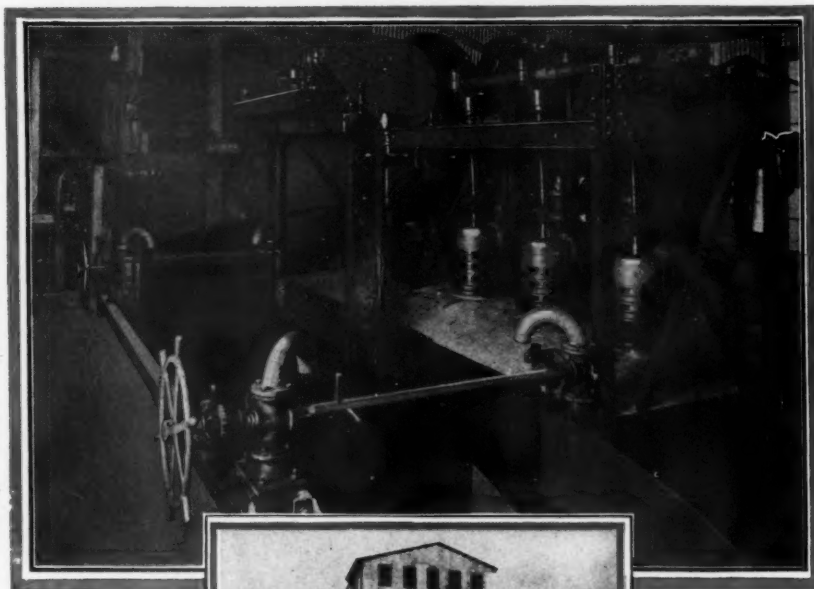
PENNSYLVANIA MINING MACHINERY CORP.
ST. BENEDICT, PENNA.

2007 GRAYBAR BUILDING (GRAND CENTRAL TERMINAL) NEW YORK, N. Y.

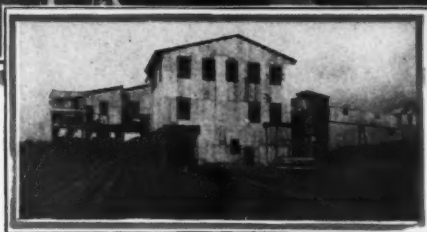
SOME PEALE-DAVIS INSTALLATIONS



A new era in American Coal Cleaning



Top view of Simon-Carves Washer; with air-supply valves, driving mechanism, and air compressor in right background. Washing



compartment in foreground, with refuse gate regulating mechanism and hand wheels at entrance and exit ends; also air relief valves.

THE completion of this, one of the first plants in America to utilize a Link-Belt--Simon-Carves Coal Washing unit, indicates a trend of far-reaching importance, we believe, to the coal mining industry.

This is the plant of the Central Indiana Coal Co., Linton, Ind., which Link-Belt Company partially re-equipped, increasing the output and giving better preparation both as to sizing and cleaning.

It is hard to imagine a more difficult cleaning problem than that presented for the Link-Belt--Simon-Carves Washery in this installation. The coal has 30% to 35% of impurities, but

the new process cuts this down practically to inherent ash; and wastes no coal in the refuse.

Instead of the weeks of experimenting and adjusting often required in starting other types of washers, this Simon-Carves Washer was turned over to the company's own crew after only 20 hours of actual operating time.

Whether or not the Simon-Carves System means (as one enthusiast writes), "a new era in American coal cleaning", it is an improvement on previous methods radical enough to claim the interest of every mine official. Ask for Bulletin 1042.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying, and Power Transmission Machinery and Chains

CHICAGO

300 W. Pershing Road

LINK-BELT

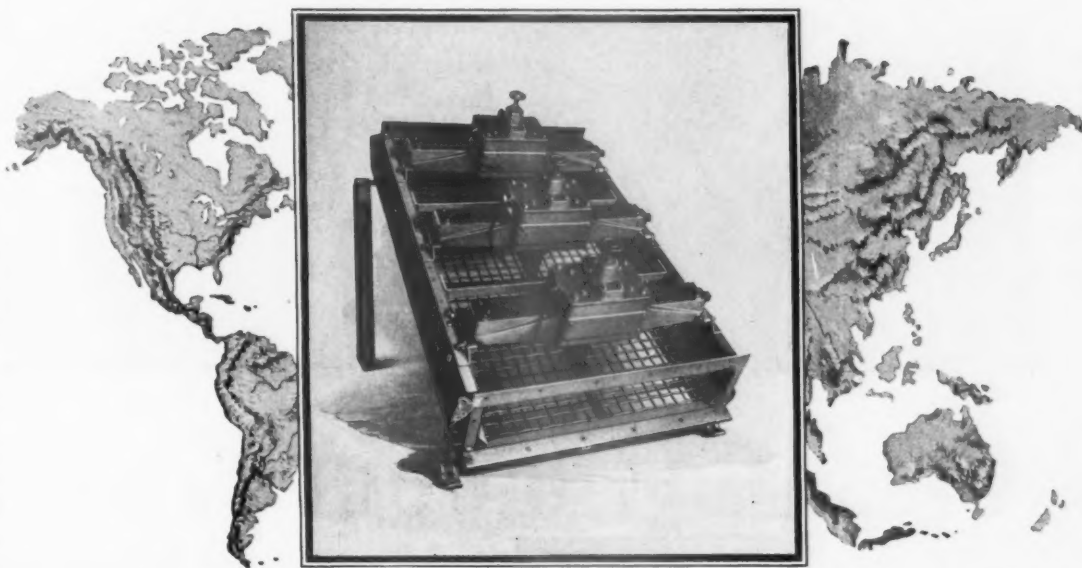
Simon-Carves Coal Washeries

The World's ! Champion !

▲▲▲

1. More units in use than all other vibrating screens combined.
2. Highest tonnage per square foot.
3. Lowest up-keep cost.
4. Greatest dependability.
5. Closest separations with big tonnage.
6. BIGGEST PROFITS TO USER!

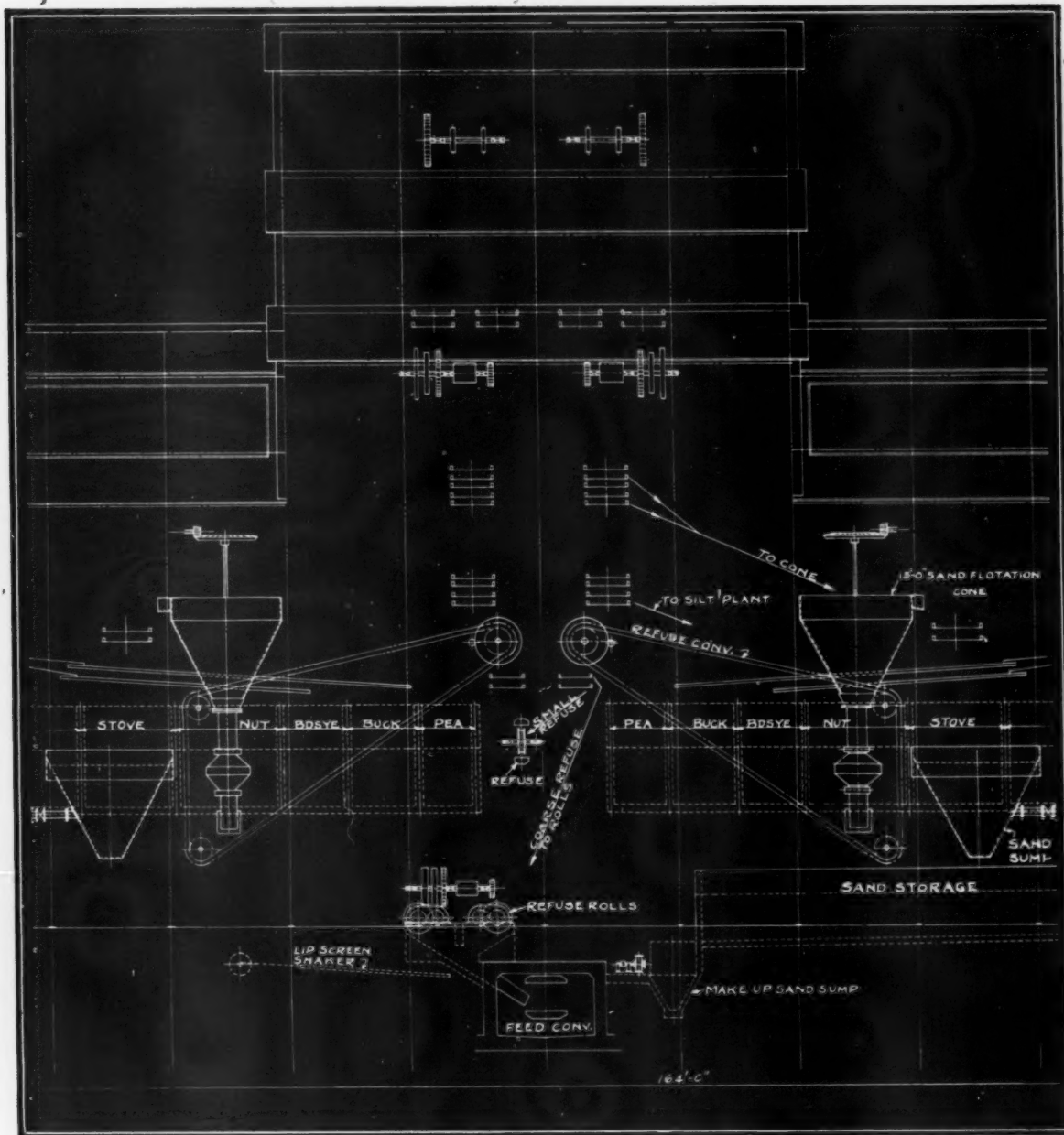
THE W. S. TYLER COMPANY, *Cleveland, Ohio*
Manufacturers of Woven Wire Screens and Screening Equipment



Send
for
the book,
"SCREENING
FOR PROFIT"

HUM-MER Electric Screen

Screens
from
Coarsest
to Finest
Materials,
Wet or Dry

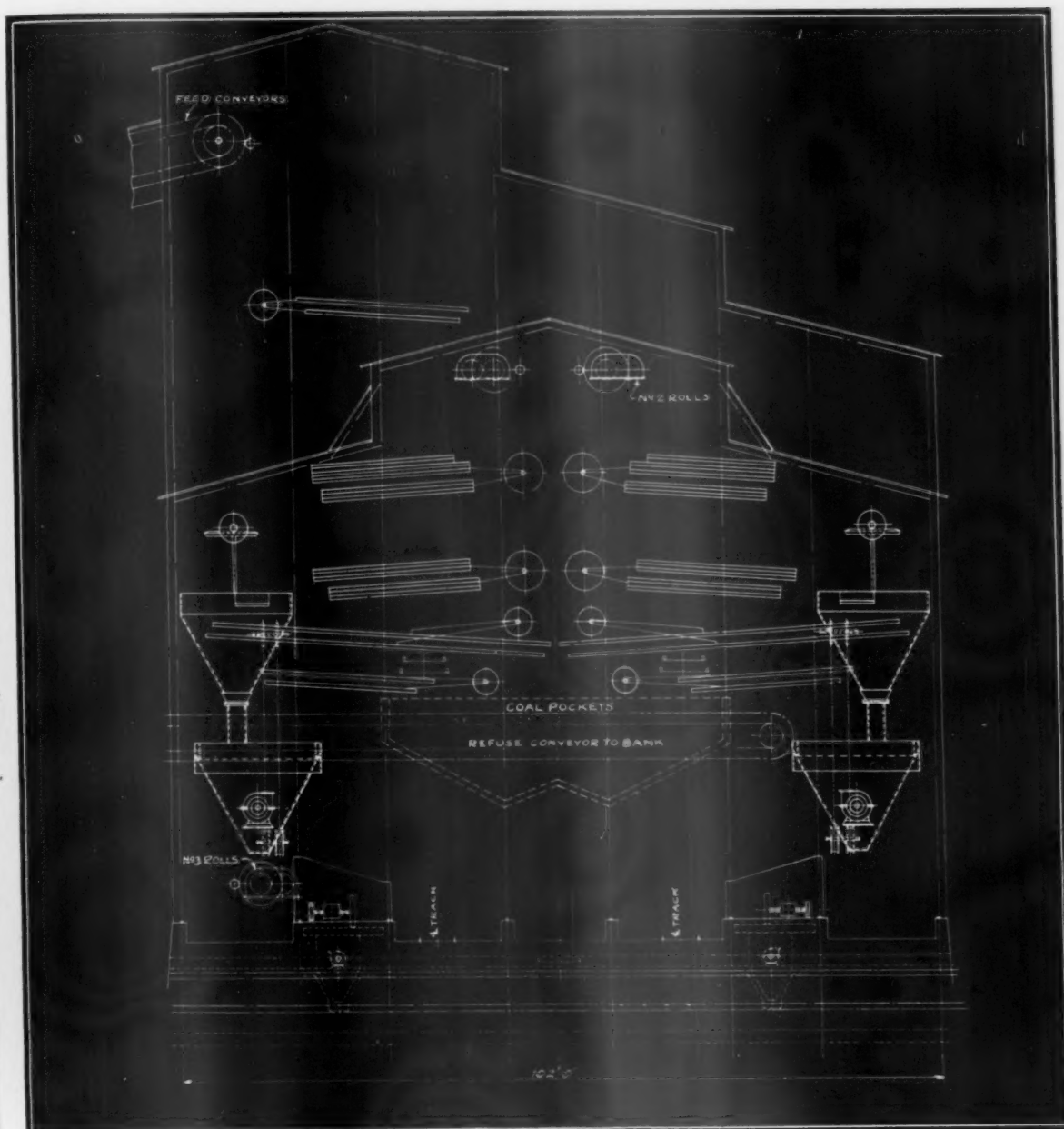


SIDE ELEVATION

Cleaning 6,000 Tons of At Marvine Breaker of H

THE Marvine Breaker of the Hudson Coal Company was completed and placed in operation early in 1921, and was considered to be a model of efficiency. It employed as cleaning elements forty-four of the latest type jigs and shipped an average of 5,000 tons per eight-hour day. For many years this breaker continued to be the pride of the officials and engineers of the Hudson Coal Company. As years passed, however, it became more and more evident that new systems of

Anthracite preparation offered advantages and much time and money was spent by this progressive company in experimenting with all types of cleaners. Their object always in mind was to be able to ship the cleanest possible product with a minimum amount of loss to the rock bank. Of all types of equipment the CHANCE COAL CLEANER was determined by their tests to be the most efficient and economical and the executives and engineers decided to adopt it.



END ELEVATION

Coal Per Eight Hour Day of Hudson Coal Company

The work of changing the Marvin Breaker from forty-four jigs to four 15' Chance cones started August 26, 1928, and without loss of tonnage during the change was finished and operating on February 28, 1929. This breaker is now averaging shipment of 6,000 tons per eight-hour day and the quality of its product is emi-

nently satisfactory to its owners and to its customers. The coal shipped contains practically no slate and at the same time the rock bank losses are reduced to a minimum. In fact so satisfactory are the results that work has already begun on the design for similar changes to another Hudson Coal Company breaker.

H. M. Chance & Co.
Engineers
Drexel Building
Philadelphia, Penna.

Chance Coal Cleaner

M. A. Walker, Manager
Mears Building—Scranton, Pa.

H. O. Staples
Sole Anthracite Licensor
Mears Building
Scranton, Penna.

THE ALLEN & GARCIA COMPANY OCCUPIES A UNIQUE POSITION

among companies serving the coal mining industry. Allen & Garcia Company sells service—*results*, and not *devices*.

It takes years and money for an operator to build up his own designing and construction organization and when he has done so, few operators can keep such an organization busy, and the organization tends to become "ingrowing."

The Allen & Garcia Company under its Service Plan functions as *the operator's construction organization* for the time being, thus giving the operator:

Seasoned experience.

An expert organization.

Familiarity with the latest practice both here and abroad.

A greatly increased purchasing power.

The Allen & Garcia organization co-operates so far as possible with those manufacturers best fitted by skill, reliability and favorable location for handling each piece of work. As much work as possible is always done or placed locally.

Through Allen & Garcia Service, the operator, wherever he is located, may obtain the best and most up-to-date designs and methods as applied to his particular problem.

Allen & Garcia Service covers all engineering work connected with coal mining, including Reports, Appraisals, Construction of Plants, Tipples, Wet or Dry Washeries, Power Plants, Electrification, Mining Systems, Mechanization, etc., etc. All work is done for cost plus a very reasonable fee.

ALLEN & GARCIA COMPANY

332 So. Michigan Ave.,

CHICAGO

Birmingham Office: Comer Bldg.

ALLEN &

ENGINEERS AND BUILDERS
DESIGNING - CONSULTING - CONSTRUCTING - TIPPLES - WASHERIES



GARCIA

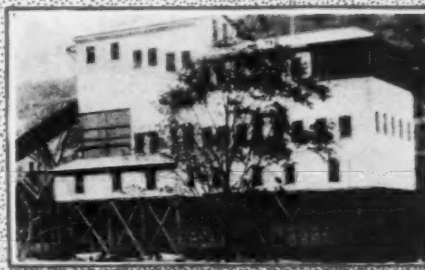
OF MODERN COAL OPERATIONS
COMPLETE PLANTS - POWER PLANTS - ELECTRIFICATION - REPORTS - APPRAISALS



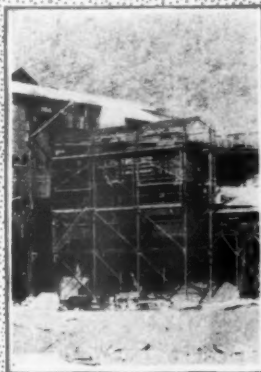
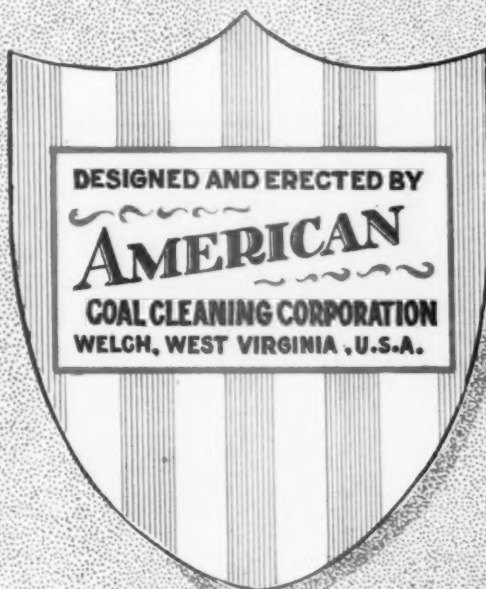
ADLINGTON COAL AND COKE CO.



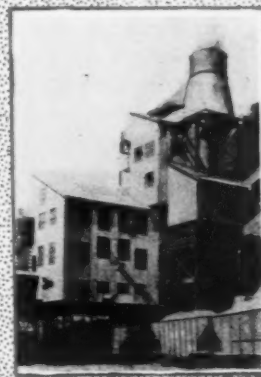
MORRISON COAL CO.



NEW RIVER AND POCAHONTAS
CONSOLIDATED COAL CO.



NEW RIVER & POCAHONTAS
CONSOLIDATED COAL CO.



GILLIAM COAL & COKE CO.



"Conditions in the coal mining industry" are improving for some mines

FOR years the newspapers and other publications of the country have stressed the unfavorable "conditions" prevailing in the coal mining industry. The high cost of producing, the unfavorable markets, and the languishing condition at the mines, have been constantly played up.

All this may have been justified by the facts. But all the while, adversity has been forcing progress upon the coal mines. New ways have been found with which to displace old methods.

A saving in labor has been made possible by reason of improved tippie layout—by a better co-ordination of cleaning, sizing, and loading operations. Good combustible that formerly went to the refuse piles, is being recovered at many mines. Coal is being prepared to meet the demands of present-day markets.

The illustrations reproduced herewith indicate just some of



the ways some of the mines are accomplishing these betterments. These are but a few "kinks", out of the complete program of better coal preparation methods sponsored by Link-Belt Company.

This includes equipment for such operations as handling the coal, sizing it, separating, crushing, cleaning, and loading the prepared fuel. Good coal is turned out with the least labor and other production cost.

Link-Belt equipment is manufactured completely in the Link-Belt Company's own plants. Unlimited manufacturing facilities, as well as large resources in engineering talent, are available for the solution of every problem in the design of coal-handling and coal-preparation machinery.

Mines, both large and small, are availing themselves of these Link-Belt facilities. Mining "conditions" are improving for these mines.

Link-Belt Equipment for the Coal Mine

Coal Tipples
Coal Washeries
Loading Booms
Picking Tables

Screens
Retarding Conveyors
Car Dumps, Car Hauls
Crushers

Boom Hoists
Locomotive Cranes
Crawler Cranes
Portable Loaders

Vibrating Screens
Face Conveyors
Spiral Separators
Manierre Box Car Loaders

Conveyors of Every Type
Chains, Wheels, Buckets
Silent Chain Drives
Roller Chain Drives

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying, and Power Transmission Machinery and Chains

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St. Louis - - - - - 3638 Olive St.

CHICAGO, 300 W. Pershing Road
Wilkes-Barre - 826 2nd National Bank Bldg.
Kansas City - - - 1002 Baltimore Ave.

INDIANAPOLIS, 200 S. Belmont Ave.
Denver - - - - - 520 Boston Bldg.
Birmingham, Ala. - 229 Brown-Marx Bldg.

LINK-BELT



"HERCULES" RED-STRAND WIRE ROPE

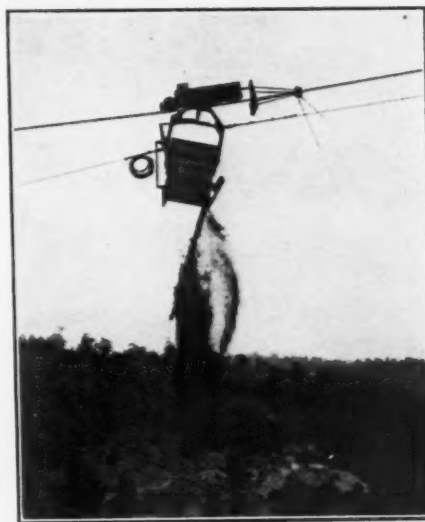
REG. U.S. PAT. OFF.

For Economical Wire Rope Service

The exceptional strength and sturdiness of "HERCULES" (Red-Strand) Wire Rope enable it to handle a large tonnage for each dollar of its cost, and its long life reduces time lost in making rope changes.

All "HERCULES" (Red-Strand) Wire Rope is made of acid open-hearth steel wire, and every wire used is first rigidly tested by us to make sure that it meets our exacting requirements. Any wire lacking—if only in a minor detail—is promptly rejected.

We recommend this wire rope especially for use on mine hoists, inclines, mining machines and shovels. It is made in both Round Strand and Patent Flattened Strand constructions in order to meet all working conditions. If you will tell us how you use wire rope we shall be glad to suggest the construction we consider best for your work.



Aerial Tramways

Leschen Aerial Wire Rope Tramways are daily demonstrating that they are economical carriers of coal and mine waste. Their correct design and sturdy construction enable them to operate on a very low upkeep cost. If you are interested in reducing your expense for transporting coal and disposing of mine waste, we would like to have you write for a copy of our catalog No. T-25, which explains our various systems and illustrates many of our installations now in service.

*We would appreciate a visit from you at our Booth No. 295
American Mining Congress, Cincinnati*

Made Only by **A. Leschen & Sons Rope Co.** Established 1857

5909 Kennerly Avenue
ST. LOUIS

New York

Chicago

Denver

San Francisco

Distributors at over 100 different points. The name of our Distributor in any particular locality will be gladly furnished upon request.

HAZARD

—Again Sets a Record For Wire Rope Service



**WIRE ROPE
SERVICE RECORD**
at Sonman Shaft Coal Co.
Portage, Penn.

Rope Used—10,000 ft. 1" dia. 6 x 7 Hazard Cast
Steel Lang Lay.

Service—Inside haulage—hauling 22 cars per
trip weighing 3 tons each—total 66
tons per trip.

Average grade of haul is 8.6%
Speed of trip—600 ft. per minute.
Drum dia. 6 ft.—48" face and 12" flange.

Length
of Service—Over 9 years in Continuous Service
Rope installed Feb. 2, 1920.

Hazard Wire Rope on Hoist
at Sonman Shaft Coal Co.
This rope gave continuous
service for over 9 years.

HAZARD WIRE ROPE FOR
EVERY SERVICE

Room Hoists	Drag Lines
Power Shovels	Aerial Tramways
Shaft Ropes	Haulage Ropes
Mining Machines	Slope Ropes
	Special Ropes

UNDER the severest operating conditions—running for over a mile through coal dust and over broken coal, rock, rails and switches, this regular construction Hazard Wire Rope defied abrasive wear for more than 9 years in continuous service.

Because of this outstanding ability of Hazard Wire Rope to resist abrasion and maintain its full strength for longer periods of time, Hazard Rope is invariably specified for every mining service.

Complete stocks carried at branches listed.

HAZARD WIRE
WILKES-BARRE



ROPE COMPANY
PENNSYLVANIA

New York Chicago Pittsburgh Philadelphia San Francisco Denver Los Angeles Birmingham

WIRES • LEAD AND STEEL TAPED CABLES • FLEXIBLE CORDS AND CABLES • RO

+ BARE AND TINNED WIRE AND CABLE • MAGNET WIRE AND COILS • RUBBER COVERED

SPECIAL WIRES

REPAIR SERVICE • TRENCHLAY • ENTERITE • AND TREE WIRES

BEFORE VULCANIZATION AFTER VULCANIZATION

SUPER SERVICE
CORDS and CABLES

Four years on the same job

In a mine. Constant usage. Cruel abuse. Dragged, jerked, wound. Sharp rock...muck...grime.

Yet the uninterrupted production of a costly machine depends upon this slender line of Super Service cable.

And Super Service delivers—day after day after day.

Mutely it takes its punishment...and goes on *delivering*...because it is *vulcanized under tons of pressure in steel molds*. Its new rubber jacket is even stronger. It ages even better than ever before.

Wet-proof, "kink"-proof, resistant to oil, tough—a victor over its worst environment.

Economy follows Super Service. Try a length and see.

ROME WIRE COMPANY, Rome, New York
Division of General Cable Corporation

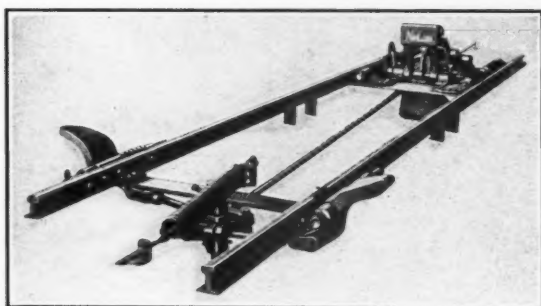
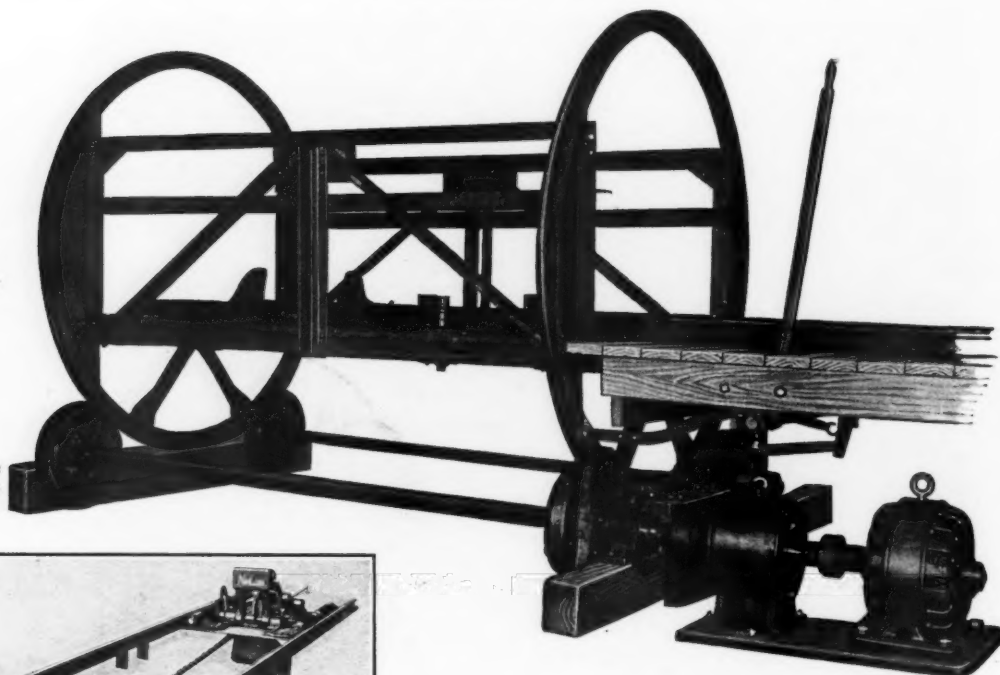
2903

Visit spaces 47 and
48 at the Mining
Congress Convention.

ROME WIRE

The Nolan Rotary Dump.

Nolan Automatic Safety Bumper-Stop Feeder.



Increasing

SPEED, CAPACITY and LUMP

HANDLING equipment that increases speed, capacity and lump increases the capacity of your mine and the quality of your output. Tremendous investments are sometimes made to bring just these results. All that may be necessary at your mine is the efficient, simple and strong pair shown above. The ROTARY DUMP operates easily and safely with less labor; various types of cars may be dumped; cars need not be uncoupled; they are dumped singly or in tandem; the sturdier solid body cars with their greater capacity may be used; coal degradation is greatly reduced as the motion of the dump pours the coal gently on a deflection plate. Operation is extremely sure and simple mechanically, and little power is consumed.

The Nolan Automatic Safety BUMPER-STOP FEEDERS are the latest and best development of feeding devices. They are safer and surer. They catch the car on the one place designed to withstand bumps—the bumper! They allow the handling of long, heavy trips without injury to cars even where axles are weak. Grades need not be changed. Operated either automatically or by hand they speed operations safely at shaft bottoms, with cradle, rotary, crossover or kick-back dumps or at the head or foot of inclines.

Installation of these Nolan devices is not expensive.

See us at the Cincinnati Exposition or send for descriptive booklets.

Ask us more about these

NOLAN

PATENTS

in
CINCINNATI
Booth 296

THE MINING SAFETY DEVICE CO.
BOWERSTON, OHIO

Roebling

"BLUE CENTER"

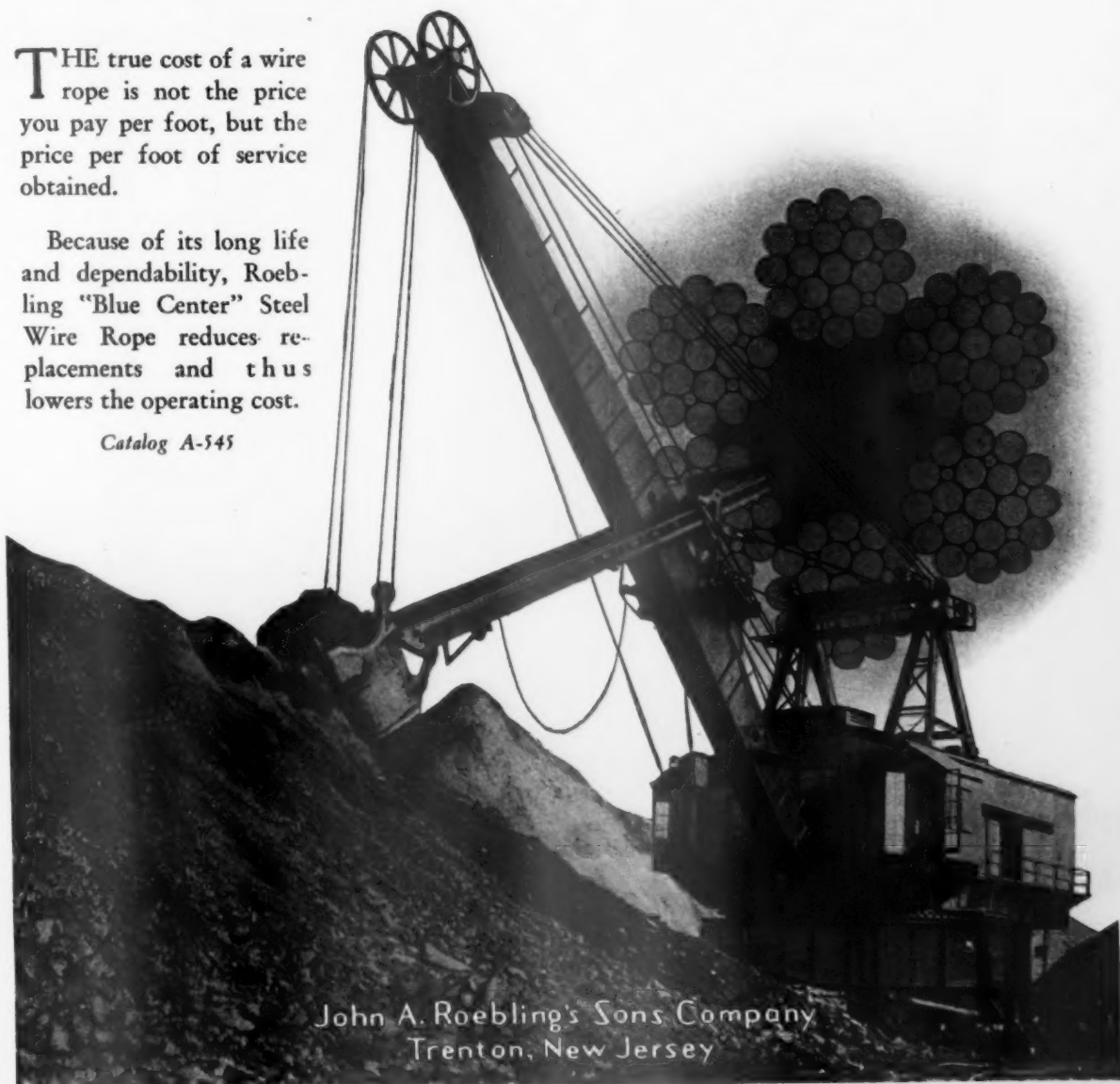
STEEL WIRE ROPE

Efficiency is Economy

THE true cost of a wire rope is not the price you pay per foot, but the price per foot of service obtained.

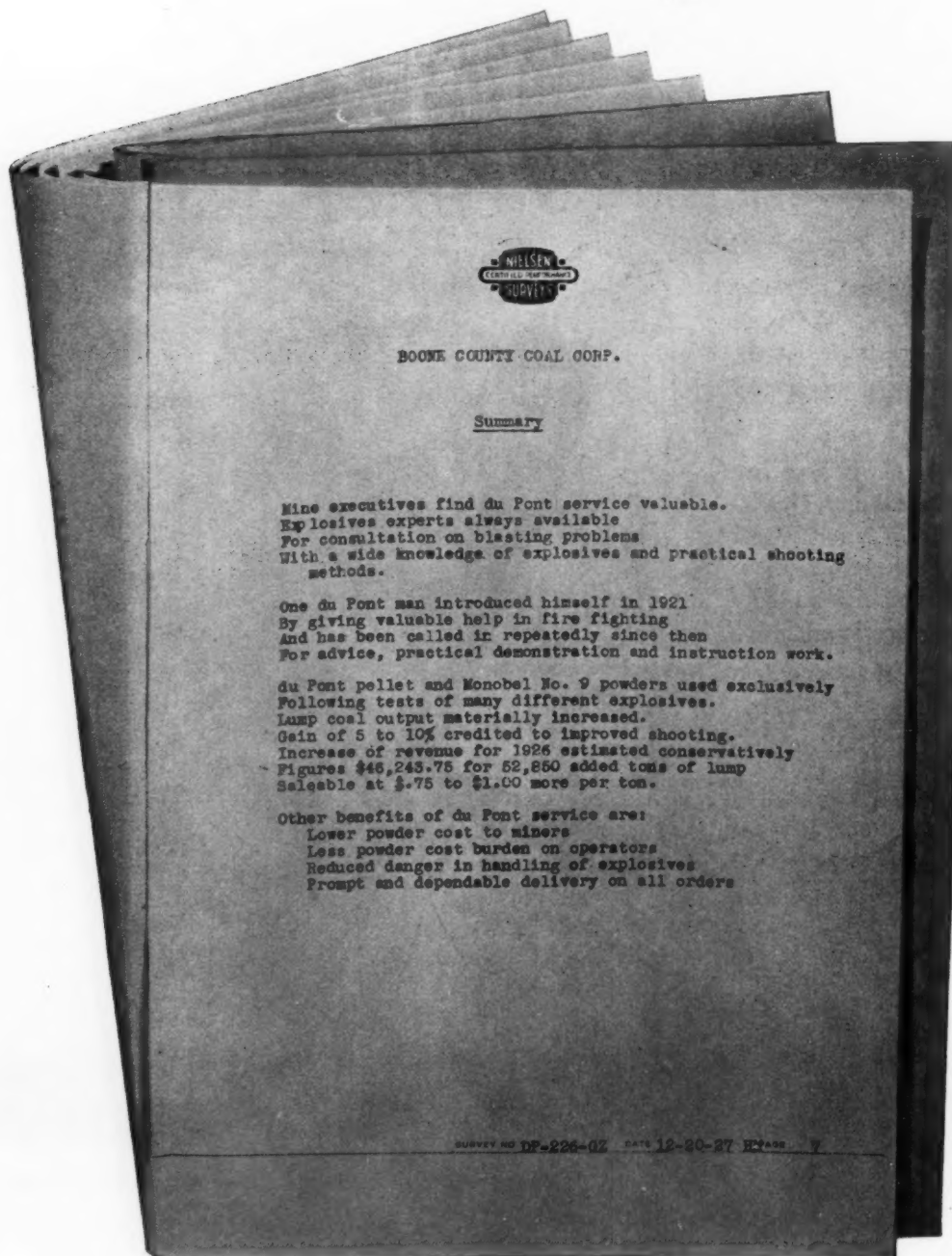
Because of its long life and dependability, Roebling "Blue Center" Steel Wire Rope reduces replacements and thus lowers the operating cost.

Catalog A-545



John A. Roebling's Sons Company
Trenton, New Jersey

\$46,243.75 increased revenue and explosives costs credited by *Du Pont Explosives*



Write for a copy of this survey made by the A. C. Nielsen Company, Chicago.
Valuable points for any coal mine operator

\$2,880 cut in Boone County Coal Corporation to *and Technical Service*

THE Boone County Coal Corporation is one of the most progressive operators in the southern West Virginia coal fields. Its three mines near Sharpless are producing over a million tons annually of medium-hard, high-grade bituminous coal.

After extensive trials during several years, in which fifty or more explosives were tested, the Boone County Coal Corporation standardized on du Pont Pellet Powder where they had been using granular black powder, and du Pont Monobel No. 9, where a permissible explosive was required. These mines used the first carload of Pellet Powder shipped by the du Pont Company.

The Boone County Coal Corporation takes full advantage of du Pont technical service. The du Pont field representative instructs the miners in the proper use of explosives, develops new shooting methods, and submits complete reports of his findings to the mine executives. His tactful cooperation with the miners has won their confidence and support.

\$360 a month, or \$2,880 a year, was saved by cutting the consumption of explosives 40%. At the same time the quality of the coal brought down was greatly improved. The production of lump coal was increased 5% to 10%. About 67% of one year's output of 1,057,000 tons was lump coal over 1½ inch size. This 5% improvement in lump coal production, therefore, resulted in a net gain in lump output of 52,850 tons. At the average differential between 75c to \$1, or about .875 per ton, for coal over and under the 1½ inch size, the gross increase in revenue for one year, due to better shooting, was \$46,243.75.

Prompt delivery of du Pont explosives and their unfailing uniformity are highly praised by executives of the Boone County Coal Corporation.

Dynamite is not "just dynamite." There is no substitute for a century and a quarter of experience in the manufacture and servicing of explosives. Why not let a du Pont representative offer his suggestions?

You are Invited to Visit Booths 65 and 66 at the National Exposition of Coal Mine Equipment to be held in Cincinnati, May 13-17, 1929

Please refer to pages 205, 6, 7, 8 of the 1928 edition of *Keystone Coal Mining Catalog* for detailed information regarding Du Pont explosives and blasting accessories required for coal mining.



E. I. DU PONT DE NEMOURS & COMPANY, Inc.

Explosives Department

WILMINGTON

DELAWARE

CARDOX

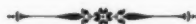


"THE SAFETY MINING CARTRIDGE"

Permissible Blasting Device. Approval No. 1

The CARDUX Method is a new process for dislodging coal at the working face, using carbon dioxide as the blasting medium. CARDUX is non-explosive, producing no flame, smoke or fumes. Its use offers certain important advantages.

1. CARDUX creates a superior product.
 - a. Lump coal is increased.
 - b. Coal ships better; resists degradation.
 - c. Slack coal is decreased.
2. CARDUX insures better production.
 - a. Entries advance faster.
 - b. Coal is rolled free at the face.
 - c. Management controls strength of blasting agent.
 - d. No delay waiting for air to clear.
 - e. Less roof shattering; less timbering.
 - f. Less breakage of impurities; more easily separated.
3. CARDUX augments safety.
 - a. Non-explosive.
 - b. Ignition of dust or gas impossible.
 - c. No smoke or fumes.
 - d. Safer roof conditions at face.
4. CARDUX increases net realization.
 - a. Profits are in lump coal; more lump.
 - b. CARDUX lump gets a premium price.
 - c. CARDUX promotes mechanization.



See us at Cincinnati—Spaces 241-242

SAFETY MINING COMPANY
307 North Michigan Avenue ~ CHICAGO



INGERSOLL-RAND **EQUIPMENT** *for* **THE COAL MINE**



Probably never before in the history of mining has the demand for time and labor-aiding equipment been so pronounced as it is to-day.

Ingersoll-Rand equipment for the Coal Mines includes:

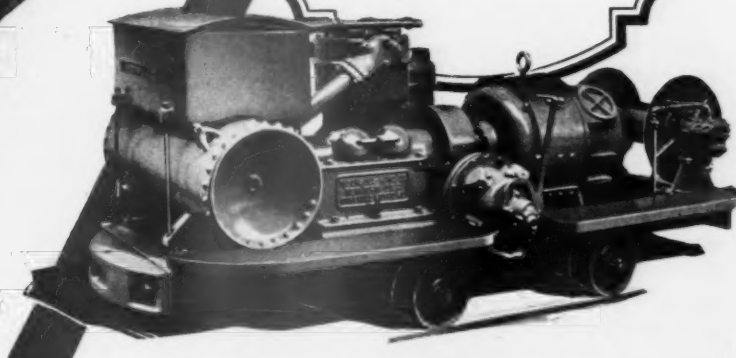
- Mine Car Compressors
- "Jackhammer" Drills
- Drifter Drills
- Paving Breakers
- Cameron Pumps
- Tie Tampers
- Track Tools
- Riveting Hammers
- Portable Hoists
- Safety-First Saws
- Trench, Clay Diggers
- Drill Steel
- Coke Furnaces
- "Leyner" Sharpeners

Let us help you with your problems

INGERSOLL-RAND COMPANY
11 Broadway, New York City

Branches or distributors in principal cities the world over

For Canada Refer—**Canadian-Ingersoll-Rand Co., Limited,**
 10 Phillips Square, Montreal, Quebec



10-MC.

Ingersoll-Rand

SAFETY IS THE WATCHWORD at Nemaocolin

One of the Most Modern Mines
in Western Pennsylvania



EDISON LAMP HOUSE, NEMACOLIN MINE.
Buckeye Coal Company, Nemaocolin, Pa.
Subsidiary of Youngstown Sheet and Tube Company

1000 EDISON Model F Lamps
Furnish **SAFE, DEPENDABLE** and
ECONOMICAL ILLUMINATION
at this World Famous Mine

Wherever *Safe, Dependable* and *Economical Illumination* is considered, Mine Owners naturally turn to **EDISON ELECTRIC SAFETY CAP LAMPS** for Mine Owners have long since recognized the Dependability of **EDISONS**, noted for their rugged Battery Construction and Low Maintenance Cost.

EDISON Lamps can be installed in your mines on a Rental Contract without one penny of Capital Investment. Thousands of **EDISON Lamps** on Rental Contract today testify to the merits of this method of installation.

See the Edison Display! Visit M-S-A Booths No. 234 and 235.



MINERS AT NEMACOLIN
Wearing **EDISON Model F Electric Safety Cap Lamps**
Which Furnish Maximum Illumination
Approved by U. S. Bureau of Mines

Mine Safety Appliances Co.
Braddock, Thomas and Meade, Pittsburgh, Pa.

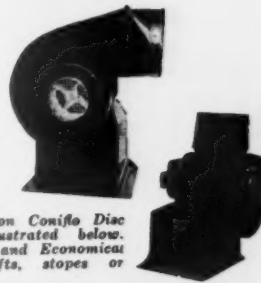
"Everything for Mine and Industrial Safety"

BOOTH 101

CINCINNATI CONVENTION

What's new? What is the most efficient equipment to use for various purposes? They are always the questions asked by the practical men of industry. These questions are answered at conventions. Then the new things in the industry—the most efficient equipment—can usually be seen at the exhibits. Booth 101 this year will be headquarters for demonstrating the new and most efficient mine ventilating equipment. Be sure to visit this exhibit.

The illustration below shows Robinson Tubing Blowers. These blowers are arranged for any angle of discharge. Equipped with outlets for use with tubing.



Robinson Coniflo Disc Fan illustrated below. Durable and Economical for shafts, stopes or drifts.

THE ROBINSON BOYS WILL BE THERE

As heretofore the Robinson engineers will be on the job to demonstrate their products. Mr. J. R. Robinson, M. E., author and publisher of the text-book, "Practical Mine Ventilation," will be in attendance and available for consultation on all ventilating problems pertaining to the mining industry. Be sure to look us up.



Robinson Turbine Wheel. The high efficiency and low cost of maintenance of Robinson installations is due to the scientific construction of this wheel.



ROBINSON VENTILATING CO., ZELIENOPLE, PA.



ROBINSON FANS



A prize winning plan for DRY ENFORCEMENT

THOSE annoying places where water collects—where locomotives and mine cars must splash through—where loader or cutting machine must sometimes operate—where men must work. These places that retard operation, that hasten depreciation of equipment and that are sometimes sources of short circuits can be easily eliminated. A sump a few inches wide and deep is all the space necessary for the LaBour Gathering Valves. These valves connected to a LaBour Centrifugal Pump, or any other capable of handling small amounts of air, are entirely automatic. They are made of non-corrosive materials, are small and easily portable and positive in operation.

Fill in the coupon below and let us send you one or all of these free booklets describing the LaBour Centrifugal Pumps and the ease of operation of the LaBour Gathering Valves.

No. 29

No. 27

No. 30

THE LABOUR COMPANY,
Chicago Heights, Ill.

Kindly send me the free bulletin or bulletins I have checked below:

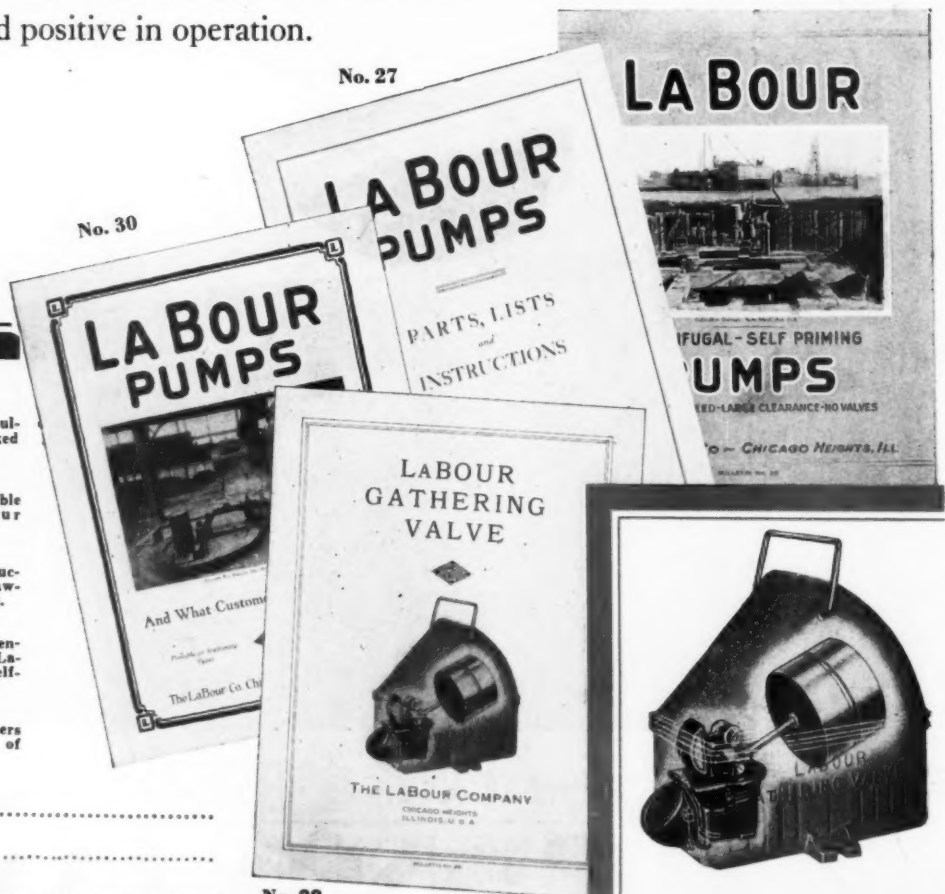
- ☐ No. 28. Describes the dependable action of the LaBour Gathering Valves.
- ☐ No. 27. Parts, lists and instructions with detail drawings of LaBour Pumps.
- ☐ No. 29. Booklet describing generally applications of LaBour Centrifugal—Self-Priming Pumps.
- ☐ No. 30. Testimonials from users showing the efficiency of these pumps.

NAME

ADDRESS

.....

No. 28





Photograph of a LaBour Centrifugal Pump installation

THE LaBour Centrifugal Gathering Pumps are self priming, dependable and automatic. They are simple and do not easily get out of order. They will actually pump air emptying the suction lines of water from a depth of 20 feet below its level. They are made in a variety of sizes for low headwork with a choice of motor, belt or gasoline engine drive. Send the coupon for descriptive bulletins.

Elcomet is a strong ductile metal highly resistant to acids. We believe you will find it hard to surpass the combination of the efficient and sturdy LaBour Pumps and Elcomet.

This pair has a dry act of its own and enforces it.

**LABOUR CENTRIFUGAL PUMPS
GATHERING VALVES**

BACK OF THE CONVENTION

OUT of the bowels of the earth comes the stamina of industry! The vision, courage and accomplishment of the mining industry makes possible the material basis of our civilization. The responsibilities and the hazards of this industry are great—the prosperity of the whole country is interwoven with it. That it may present a united front where it must fight and that it may acquire larger vision in its great economic problems the majority of all mining enterprise of the country has combined in a great constructive and unifying organization whose record is closely written with that of the mining industry. Membership in this organization carries with it many benefits. This great annual convention is one outgrowth of this organization. The whole industry gains from each membership.

For information about membership
address



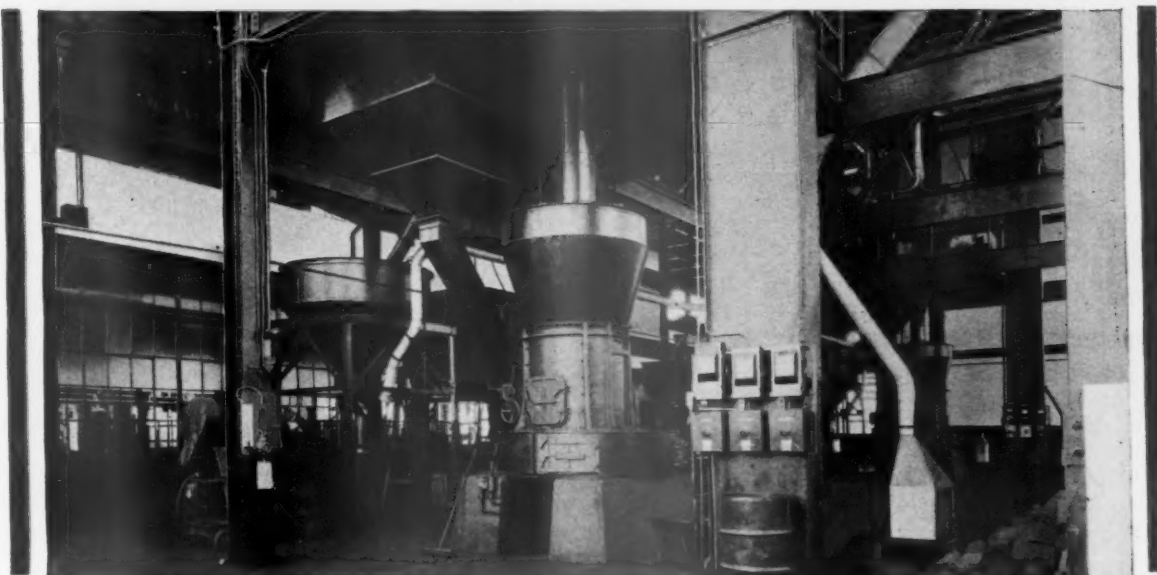
THE AMERICAN MINING CONGRESS

841 MUNSEY BUILDING, WASHINGTON, D. C.

♦♦ BEHIND THE PYRAMIDS—5 ♦♦



It takes more than CARBON to make a brush



Part of crushing and milling equipment

OUT of the fiery furnace come hard blocks of practically pure carbon, but these are not brushes and useful brushes could not be sawed out of them.

The blocks are crushed into small bits in a powerful machine. Another machine grinds the carbon into fine flour. The laboratory, as usual, tests each step. The flour, for instance, must meet rigid tests for electrical resistance and fineness.

Not only is this flour tested, but, to insure uniformity of the product, the output from several mills is mixed and blended after it has been passed by the laboratory.

Thus once more a basic form of carbon is

produced in a very pure, exactly uniform, scientifically controlled state.

This is but one example of the thorough control we exercise over the smallest detail of manufacture. This control is your assurance and ours, too, that any given grade of National Pyramid Brushes will always be the same, for by exactly duplicating the conditions of manufacture we duplicate the grade. Standard performance thereby is assured. The NCC brushes that are giving you such perfect service today can be replaced with precisely similar ones at any time in the future. The Data Sheet System makes shipments speedy and accurate.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide  and Carbon Corporation

*Carbon Sales
Division*



Cleveland, Ohio

Branch Offices and Factories

Jersey City

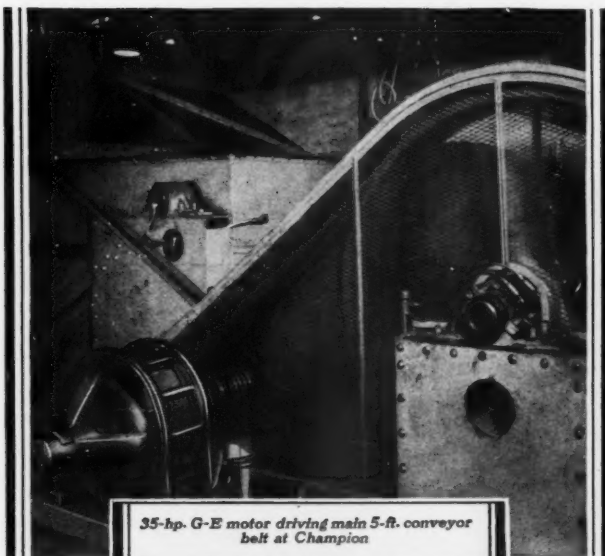
Pittsburgh

Chicago

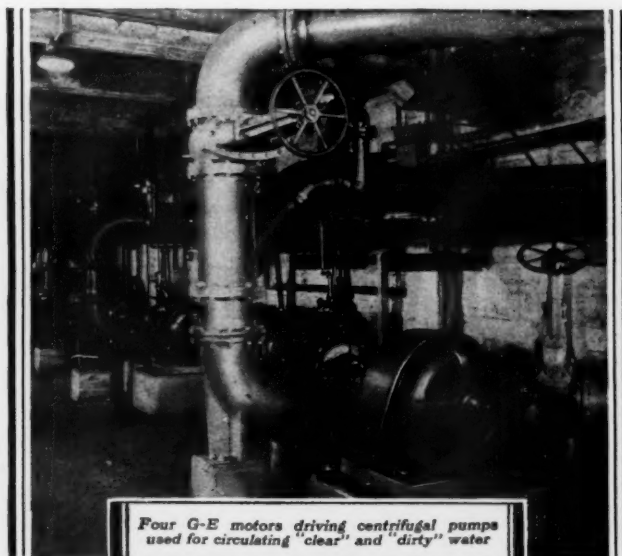
Birmingham

San Francisco

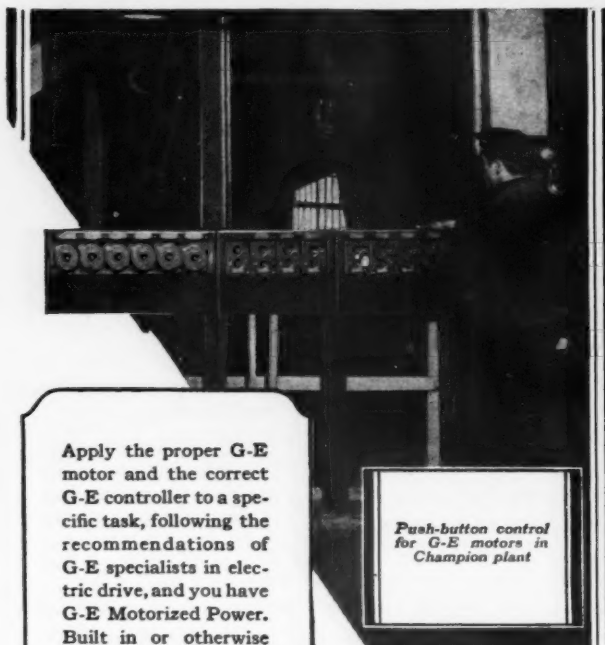
Preparing 28,000 Tons of Coal a



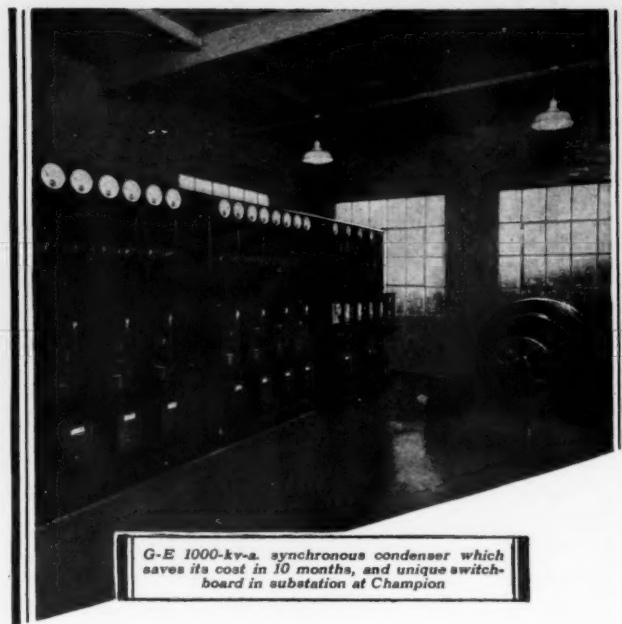
35-hp. G-E motor driving main 5-ft. conveyor belt at Champion



Four G-E motors driving centrifugal pumps used for circulating "clear" and "dirty" water



Push-button control for G-E motors in Champion plant



G-E 1000-kv-a. synchronous condenser which saves its cost in 10 months, and unique switch-board in substation at Champion

Apply the proper G-E motor and the correct G-E controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. Built in or otherwise connected to all types of industrial machines, G-E Motorized Power provides lasting assurance of performance that builds confidence.



Motorized Power
—fitted to every need

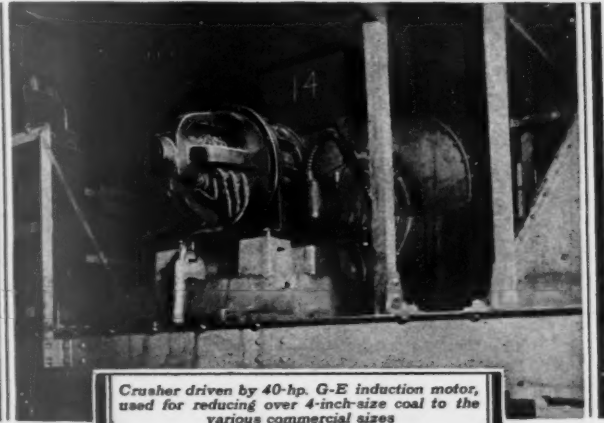
GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

a Day with G-E Motorized Power



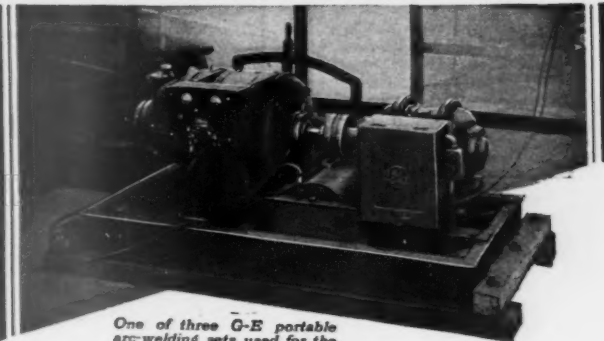
75-hp. G-E motor drive for distributing-conveyor on top of raw-coal storage bins at Warden



Crusher driven by 40-hp. G-E induction motor, used for reducing over 4-inch-size coal to the various commercial sizes



G-E controller for main car-haul drive at Champion



One of three G-E portable arc-welding sets used for the many arc-welding jobs about each plant

TWENTY-EIGHT thousand tons is a lot of coal to clean in a day, yet this is but another of the many mechanized operations which the Pittsburgh Coal Company has entrusted to G-E Motorized Power.

Just as General Electric equipment plays a leading part in every phase of mining on the extensive Pittsburgh properties, so in the new centralized preparation plants at Champion, Warden, and Banning, G-E apparatus facilitates each operation

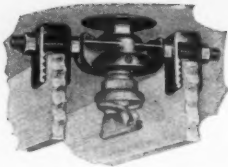
from the time the mine output is delivered to the mammoth rotary railroad car dumpers until it is delivered from the loading booms to the seven loading tracks.

New principles of preparing, sizing, and mixing are represented in these new cleaning plants. And the economic success of this advanced practice is due in no small measure to G-E Motorized Power which coordinates the electric equipment to produce the maximum efficiency at every stage in the process.

E L E C T R I C
SALES OFFICES IN PRINCIPAL CITIES

200-244

Pre-Convention Display



Dual Guard Board Hanger

This hanger serves two purposes: it insulates the trolley, and it offers the quickest and easiest known means for installing guard board. Be sure to see it. Ask questions about it. Handle it. See how it can save you time, trouble, and expense.



Gas-Tight Fused Junction Box

Do you know the complete and interesting story of this safety device? It is a story of protection to the pocketbook, to mines, to men, to machines, and to production. Drop into the O-B display and learn how this Junction Box saves money.



Form 3 Trolley Tap

You have seen trolley taps before, but never before have you seen a trolley tap like this. It is entirely new in its simplicity. Fuse renewal is made with nothing but your ten fingers—no screw driver or pliers are needed. And it is strong! Do not miss seeing this tap.



Trolley Shoe and Turret Harp

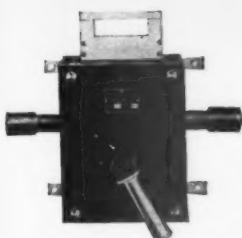
Here is a combination of two winners. A shoe proved to cut collector costs, and a new type of harp proved to cut harp replacement costs. Everyone interested in lower replacement costs will certainly want to go into every detail of these devices. Shoe for heavy locomotion only.



The O-B Exhibit, spaces 261-262 and 277-278, is easily identified by its black-and-gold striped kiosk. As soon as you see these stripes, start for this booth. It is to be one of the most interesting exhibits at the Convention.



of New O-B Devices-



1200 Amp. Circuit Breaker Switch

You may have heard about this large-capacity Automatic Circuit Breaker, but have you seen it? Do you know what is inside? Come and see! Learn how this cost-cutter will fit into your scheme to make more money from coal mining.



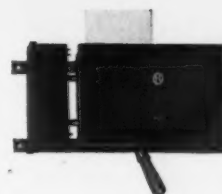
Type PC Frog

All men using or contemplating the use of 6-0 trolley wire should see this new frog. It's design eliminates the tedious and difficult work of bending 6-0 wire to conform to the contour of ordinary frogs—the wire runs through this frog in a straight line. Something new in frogs; something worth your while to investigate.



Guard Board Support

This support will save many dollars in labor for the men wishing to guard trolley that is now in place. When you call at the O-B Exhibit, examine this device most carefully. Ask the O-B salesman to explain in detail just how it works.



O-B Motor Starter

You have probably wondered how this much-talked-of O-B Motor Starter actually works. Here is your chance. This starter, in actual operation, will be on display at the O-B Booth. Do not fail to see it.

You Will Enjoy Seeing and Handling these New and Noteworthy Devices

IF YOU are mechanically minded and have that instinctive "itch" to handle mechanical things—to see how they are made and how they work—you are in for some "big moments" in the O-B booth at the Cincinnati Convention. Here you can see, handle, and ask questions about a long line of new products which have been developed to meet the new, coal-mining needs of today.

Your engineering mind will delight at the ingenuity and the sound principles of design in each one. Your sense of values will receive a pleasing shock to learn how little these devices cost in proportion to the savings they effect. Your imagination will begin to work immediately and picture where you can fit these devices in your scheme to swell the black figures of profit and diminish the red figures of expense. To miss seeing this exhibit is to miss one of the treats of the convention. So come and spend a pleasant half-hour in the O-B booth.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1088M

Ohio Brass Co.



NEW YORK CHICAGO
PHILADELPHIA BOSTON

PITTSBURGH ATLANTA CLEVELAND
ST. LOUIS SAN FRANCISCO LOS ANGELES

PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS.
VALVES



M

odern industry swings ahead with new electric tools . .

Call the roll of improved processes and equipment by which the coal mining industry piles up new records in production--and electricity answers "Here" wherever you turn.

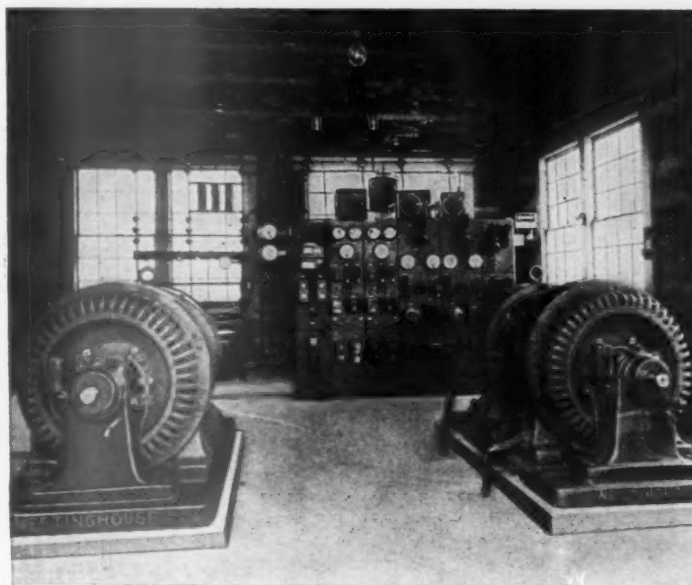
Scheduled haulage, with powerful,

reliable electric locomotives, shortens the line from working face to loading boom. Baldwin-Westinghouse locomotives have proved their economy and efficiency under the severest of operating conditions.

T 30503

Westinghouse explosion-proof motors for use on pumps, fans, room hoists, or in any other phase of operation, can be used with absolute safety in gaseous locations. Westinghouse automatic substations and switching equipment provide continuous, dependable power supply for motors, locomotives, or lighting.

Westinghouse foresaw the development of electricity in the coal industry, and Westinghouse engineering service holds a notable record of achievements in all classes of operation—underground and on the surface. The men behind this service are always available for consultation in



Automatic Sub-station in the Pennsylvania Coal and Coke Corporation.

meeting the industry's problems, in suggesting the best type of standard equipment for a given situation, or, when necessary, in designing new apparatus to meet new power requirements.

*The Sign of a
Westinghouse Dealer*



Westinghouse

T30503-A

How Westinghouse Serves the Coal Industry

For the varied requirements of light, heat, power and transportation, Westinghouse designs and manufactures equipment covering the entire range from the production of power to its ultimate application. Coal Companies can obtain, through Westinghouse, complete electri-

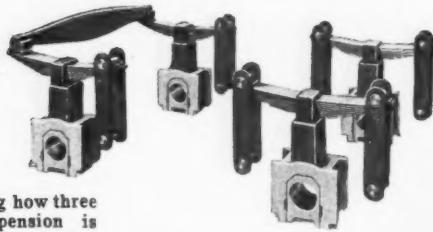


fication under undivided responsibility, including the following apparatus:

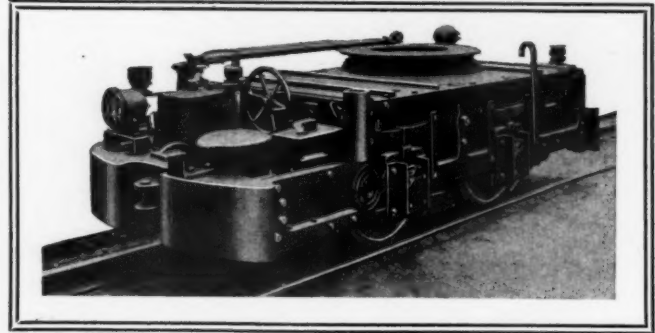
Arc-Welders	Line Material
Automatic Substations	Mazda Lamps
Capacitors	Mine Illumination
Circuit-Breakers	Motor-Generators
Condensers	Motors and Control
Electric Locomotives	Panelboards
Fans	Speed Reducers
Gears	Stokers
Generators	Switchboards
Instruments	Transformers
Insulating Materials	Turbine-Generators
Lightning Arresters	

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.
SALES OFFICES IN ALL PRINCIPAL CITIES OF THE UNITED STATES AND FOREIGN COUNTRIES

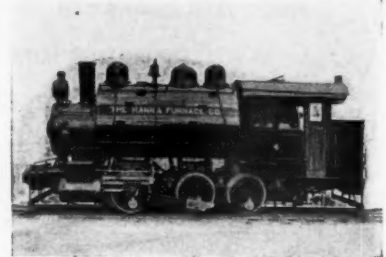
VULCAN



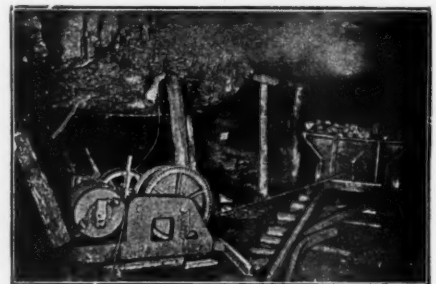
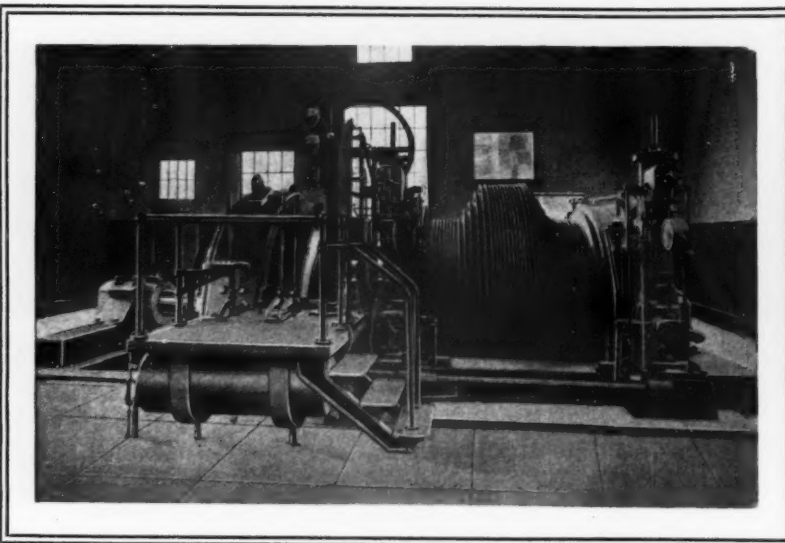
Illustrating how three point suspension is maintained in Vulcan mine locomotives.



Vulcan Shaking Chute Conveyors are unusually flexible, low in height with large capacity. They provide swinging discharge chutes, swinging and extensible shovelers and swinging joints for the conveyor itself.



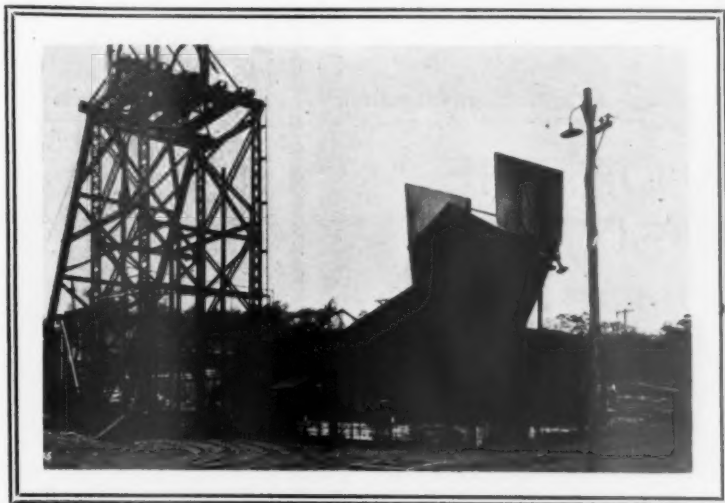
Vulcan Locomotives include electric, trolley and storage battery, steam and gasoline. They are used in all parts of the world.



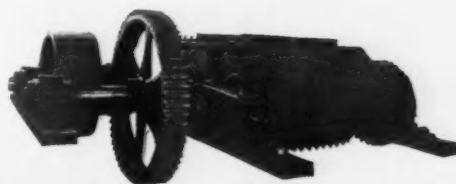
Vulcan Hoists include all sizes from room hoists shown above to those similar to the installation at the left which is one of two 1,400 H. P. Electric Hoists equipped with double cylindro-conical drums, built for Consolidation Coal Co., Chieftan, W. Va.



MINING



The 12 ft. diameter, 7 ft. wide Exhaust Fan shown above was built for the Alden Coal Company, No. 2 Shaft, Alden, Pa. Vulcan Fans are built in all sizes to meet all conditions.



Vulcan Coal Crushers are simple and rugged. They have solid rugged teeth carefully shaped for most economical crushing. Their sheet steel housing gives them maximum strength.

VULCAN equipment for coal mining runs the gamut of the most important phases of mechanization. It is backed by the wealth of experience and engineering resources gathered from 80 years of extensive service to the coal mining industry. This equipment includes all types of hoists—electric or steam—electric, steam and gasoline locomotives, mine fans, crushing equipment, cages, skips, herringbone gears, large or small steel castings and shaking conveyors.

Our experience and resources fit us especially to the task of adapting your present equipment to more modern power systems—changing from steam to electric hoists, etc.

Whatever your requirements they will be covered in our unusually complete literature. Vulcan equipment is designed for the most service with the utmost economy. Write for the bulletins about the equipment that interest you.

VULCAN IRON WORKS
WILKES-BARRE, PENNA.

EQUIPMENT

BACK OF THE EXPOSITION

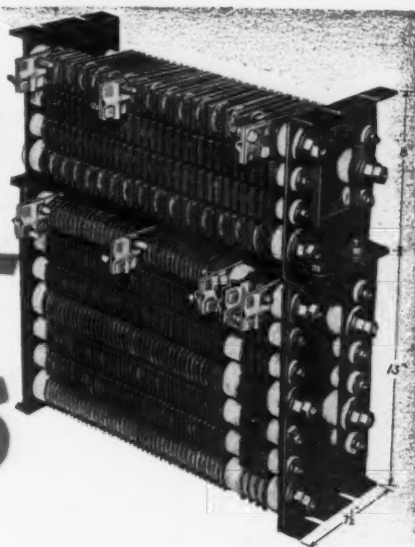
FROM the idea prompting the first few manufacturers who exhibited their machinery at earlier conventions of The American Mining Congress has grown the Manufacturers Division of that organization. This Division now stages the great expositions of coal mining equipment held in conjunction with the annual conventions of coal operators, thereby tremendously increasing the value of these outstanding yearly events. This exposition offers the most effective means for selection of equipment to the operator and the most effective means for its presentation to the manufacturer. It is mutually beneficial. It is the most economical means available to both—for the operator to keep in touch with progress and for the manufacturer to reach his market.

At the time of going to press out of 216 exposition spaces all but five have been taken. This makes a much larger showing than ever before. For information about the five spaces still available
address



THE AMERICAN MINING CONGRESS
841 MUNSEY BUILDING, WASHINGTON, D. C

More tons- less repairs- With P-G grids



HERE are true mine grids—they outlast eight to ten ordinary grids used in mine service. They are made of Homanite, a special steel alloy, which fits them to withstand the usual sources of failure of grids in mine service such as excessive vibration, dampness, sudden change of temperature and general rough handling of equipment.

Every electrical mining machine depends upon grids. Locomotives, cutting and loading machines, hoists—all represent a heavy investment that should be protected. With good grids armature roasting is prevented and controllers and gears, as well as mechanical parts, are protected. Machines are kept in operation and overtime repair costs reduced.

How great a proportion of your electrical repair costs is chargeable to grid failures?

THE POST-GLOVER ELECTRIC CO.
215 WEST THIRD ST., CINCINNATI, OHIO

*Write for further details and ask about our
90-day free trial offer.*

HOW THEY SERVE—

One mine reports 50% reduction in armature burn-outs since installing P. G.s

One W. Va. Co. reports cost of \$20,000 a year to maintain cast grids for one year on about 100 locomotives. P. G.s. installed for test purposes required no repairs whatever.

As rapidly as cast grids wear out one of the larger coal companies in Pennsylvania replaces them with P. G. Homanite Steel Resistance Grids.

Five or six years not unusual life.

One discovered in 1928 that had been in continuous operation since 1915.

Another set in service since July, 1918, and still going strong.

See Us In Booth

68

at the

Cincinnati Exposition

POST-GLOVER GRIDS

BACK OF THE PROCEEDINGS

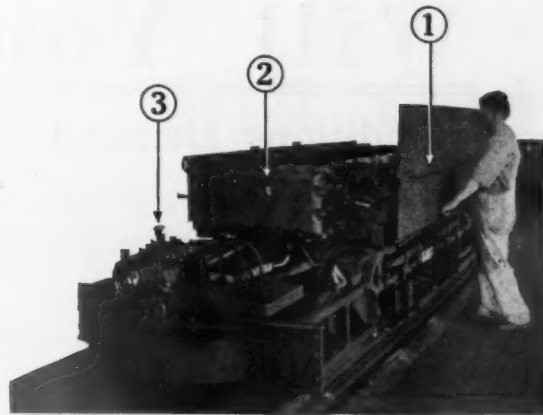
THE gist of the whole convention lies in the papers presented and the discussions they call forth. This material is a first hand, comprehensive report of progress in an industry that is making rapid strides toward complete mechanization. The annual record of this progress toward a more efficient and economical production is full of suggestions for every operator—one that many of the most progressive men feel that they can not afford to miss. It is rare that an opportunity for reviewing such a progression is presented as fully in such a practical manner. This material is published only in THE MINING CONGRESS JOURNAL. If you attend the convention can you afford to neglect this opportunity for a permanent record of the discussions? If you can not attend we are sure you will want this material—but, in either case, will it not be most valuable to pass on to others in your organization? It is a small investment of great value. It has many other valuable features.

The
MINING
CONGRESS
JOURNAL

ONE YEAR FOR THREE DOLLARS

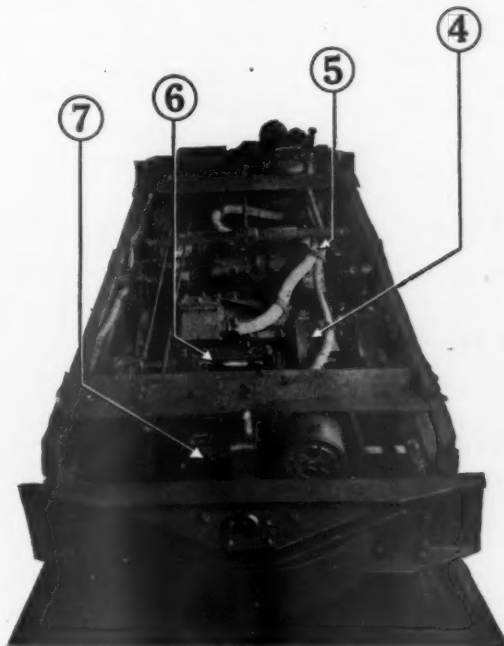
841 MUNSEY BUILDING, WASHINGTON, D. C.

Insuring Safety *with*



End and side views of Baldwin-Westingshouse Permissible Type Storage Battery Locomotive.

Baldwin-Westingshouse Permissible Type Storage Battery Locomotives



End and top views of the open chassis of Baldwin-Westingshouse Permissible Type Locomotive.

1. Cover rolls over side of locomotive facilitating access to battery.
2. Two trip-free handle breakers, charging plug, and power take-off in box.
3. Field control assures 20 to 25% more work per battery charge.
4. Two through bolts hold gear case.

IN Baldwin-Westingshouse Permissible type storage battery locomotives, all equipment, such as motors, controllers, resistors, switches and meters, are enclosed in substantial gas-proof cases. Several important features of construction and equipment of these locomotives are noted in the accompanying illustrations. Among the companies operating Baldwin-Westingshouse Permissible locomotives are the Bethlehem Mine Corporation, Hazel Brook Coal Company, Westmoreland Coal Company, and the Phelps-Dodge Corporation. Also, these locomotives have been approved by the United States Bureau of Mines.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA PENNSYLVANIA
WESTINGHOUSE ELECTRIC & MFG. CO.
EAST PITTSBURGH PENNSYLVANIA



5. Field control permits fewer cables.
6. Four through bolts hold each axle box.
7. Small sized resistor box made possible by field control.

T 30498

Baldwin-Westingshouse

Mine Locomotives

Standard Trolley
Explosion Tested Trolley

Third Rail
Pantagraph

Permissible Storage Battery
Standard Storage Battery

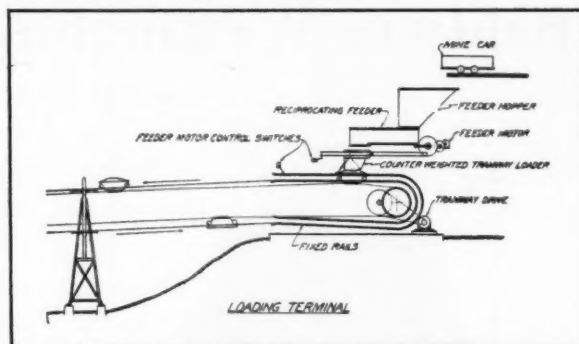
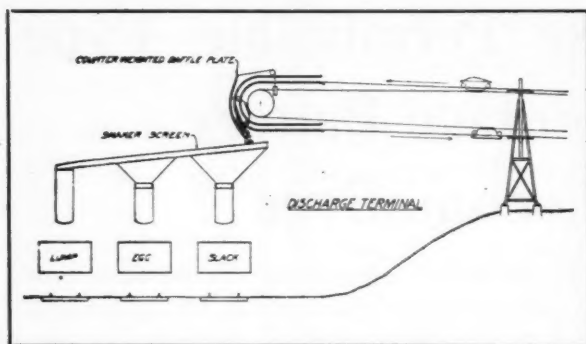
Will You Survive?

Conditions Demand Lower Production Costs!

MAN POWER IS WASTE WHERE
MACHINERY WILL DO THE WORK

In 1921, we used the above slogan to call to the attention of Coal Operators the necessity of reducing costs by introducing labor-saving machinery in the handling of coal and slate.

Among the first to see the hand writing on the wall, Interstate Engineers have kept pace with the ever-increasing call for more and more "MECHANIZATION," and now offer—



The Completely Automatic Coal Haulage Equipment

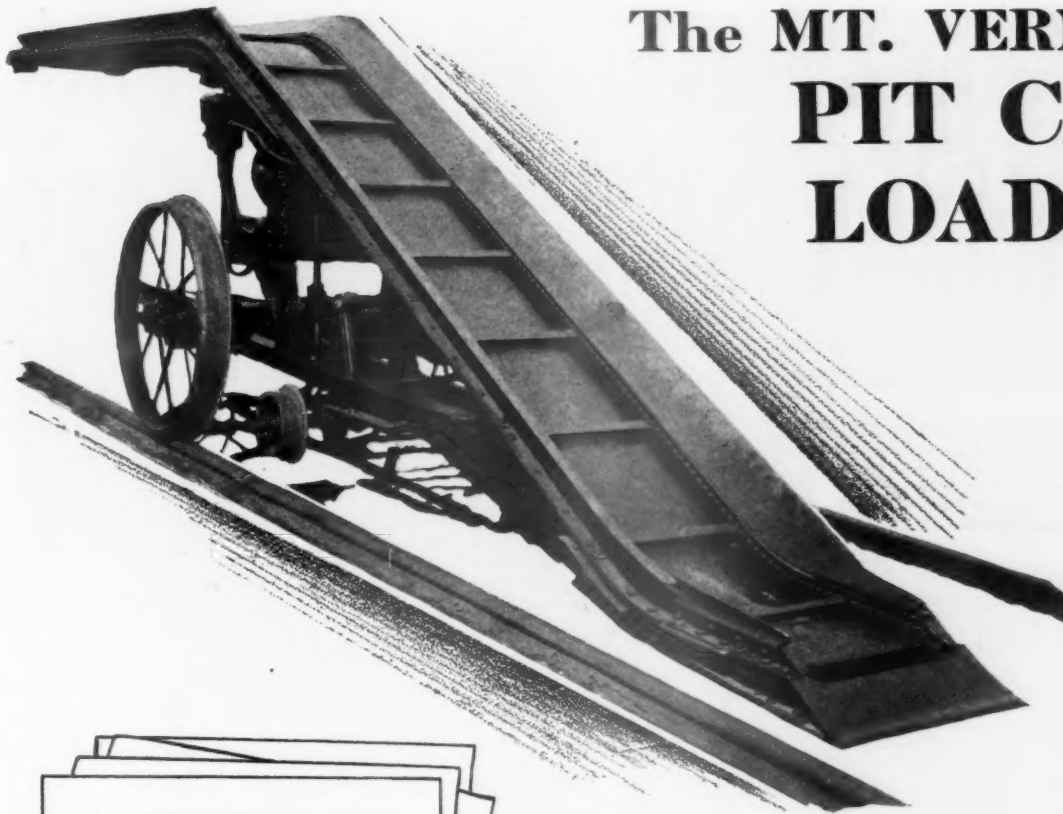
**NO LABOR — MINIMUM BREAKAGE — MINIMUM POWER
—INCREASED OUTPUT—**

The Fully Automatic Aerial Tramway — A switch is thrown and from that time on no man power is required. Let us solve your coal and slate handling problem!

INTERSTATE EQUIPMENT CORPORATION
25 Church St. New York City

AUTOMATIC Aerial Tramway

The MT. VERNON PIT CAR LOADER



CONSTRUCTION DETAILS NO. 1



The two small wheels, "A", near the floor end of conveyor have been lowered raising the loader end, "B", making the loader ready to move.

MT. VERNON EQUIPMENT—

Mine Cars
Car Wheels
Castings
Forgings
R. R. Freight Cars

TWO men can easily operate and move this new pit car loader from room to room. Built around suggestions from operating men, its superior design is shown in its simplicity, its ease of handling, its chain speed of 80 feet per minute, its efficient shovel end, and its ease of maintenance. Equipment includes Diamond roller chains, General Electric ball bearing motor and an automatic two station starting switch. It has been thoroughly tested and found to be unusually economical and efficient.

Send for more complete information about this Mt. Vernon Pit Car Loader. See it at Cincinnati in Booths 255 and 256.

The Mt. Vernon Car Mfg. Co.
MT. VERNON, ILLINOIS

Timken Bearings Sweep On to Still Greater Peaks in the Mining Industry

At the Mining Congress, May 13th-17th, check up on facts and figures about the Timken trend in Mining. You will be welcome at our display—Space 236 and 237, Music Hall, Cincinnati, Ohio

Up and up goes Mining—on and on goes Timken, mounting into unparalleled preference which sweeps Timken to still greater Peaks.

For Timken Tapered Roller Bearings bring to mining freedom from friction, full radial-thrust capacity, prolonged machine life and curtailed costs. Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken steel make these savings *permanent*.

"Timken-Equipped" represents the dividing line between the modern and the antiquated wherever wheels and shafts turn, either above or under the ground.

THE TIMKEN ROLLER BEARING CO.
CANTON, OHIO

TIMKEN
Tapered
ROLLER BEARINGS

Hoists
Cleaners
Conveyors
Mine Cars
Aerial
Tramways
Loading
Machines
Mine Locomotives
Electric Motors
Pumping
Machinery

The MINING CONGRESS JOURNAL

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No. 5

Editorials

The Opinion of the Attorney General

AN ENTIRE misconception prevails of the issues involved in the opinion of the Attorney General addressed to Secretary of the Interior Wilbur as a member of the Federal Oil Conservation Board. The *Wall Street Journal* in an editorial, "Correcting Mr. Mitchell," after various quotations of well established law, urges the Attorney General to write another letter, "correcting the impression he has already given that production of petroleum is covered by the Sherman law."

While Mr. Mitchell's opinion was a great disappointment to the representatives of the American Petroleum Institute, it is hard to understand the basis upon which they hoped for a different conclusion. The Federal Oil Conservation Board was asked to approve a plan for the limitation of the production of petroleum in order that the great waste now prevalent in that industry might be reduced. Mr. Mitchell was asked by Mr. Wilbur, as chairman of the board, "whether the Federal Oil Conservation Board has power to approve the proposed agreement and what, if any, effect such approval might have in relieving parties to the proposed agreement from the operation of acts of Congress forbidding agreements in restraint of interstate commerce."

Mr. Mitchell replied that the Federal Oil Conservation Board was created by an Executive order, that Congress had enacted no law giving it any authority and, therefore, that it had no authority to pass upon the problem presented.

The representatives of the American Petroleum Institute had led themselves to believe that the Oil Conservation Board had been clothed with judicial authority. In effect this assumption would have made the Oil Conservation Board equal in authority to the Supreme Court of the United States. Upon this point the opinion of the Attorney General was well stated, definite and clear. That the public has been misled as to the effect of this opinion is the fault of the public and not of the Attorney General.

He directly stated that the question whether the proposed agreement violated anti-trust laws of the United States "is apparently not a question arising in one of the executive departments on which the Attorney General is authorized by law to give an opinion. Furthermore, it is not the practice of Attorneys General to give opinions as to whether proposed action by private persons would violate the laws of the United States."

We have long advocated such amendments to the Sherman anti-trust law as would, under such restrictions, protect public interests, and permit agreements

by which various lines of productive industry may stabilize their own affairs in the interest of safety, efficiency and conservation.

Five Days

FIVE days, May 13 to 17 inclusive, have been set aside as a special period of concentrated effort to help solve the production problems of the coal mining industry. At Cincinnati, at this time, there will be held the annual meeting of the Practical Coal Operating Men and the National Exposition of Mine Equipment. Both are major events, and combined they offer the opportunity of the year to the coal producer to improve his production methods. The program for this meeting and a brief description of exhibits are found elsewhere in this issue. They present a most interesting contribution and offer an opportunity that no thinking coal man can afford to miss. The program is the result of the combined effort of 60 coal operators. The exposition is the result of the cooperative effort of more than 100 manufacturers. Together the convention and exposition hold high the slogan "Safe, efficient, profitable production" and show the way of attainment.

Three Reasons Why

THERE are many reasons why coal producers should attend the convention at Cincinnati, but perhaps three important features may be sufficient to convince the unbeliever in cooperative effort that the trip is worth its cost either in time or money. *First*, at no other place can the busy executive, in so short a period, learn so much concerning advanced methods of coal production. He may be planning to spend thousands of dollars in experimental work, and learn at this meeting that one of his fellow operators has already done his experimenting for him. *Second*, it offers a free course in coal mining to the men charged with the actual production of the coal. At no other place can the superintendent, engineers, electrician, foreman, learn so much in so short a period. It is given to him in concentrated doses, and he learns "what to do," as well as "what not to do." *Third*, there is the "Machinery Mart"—the exposition where 100 manufacturers will display the latest equipment. The operator may compare equipment, may inspect practically all makes of any kind of equipment he has in mind. He may see new ideas, and he at the same time may hear the same equipment described in its actual application to his own problem. Cincinnati, during the week of May 13, offers to the coal operator more than he can afford to miss.

Cooperative Enterprise

"get-together" events. They attract and bring to them a large group of coal operators who have learned from experience their very great value. They are designed in every manner for the greatest convenience and assistance to the production man. They are held in a geographic center where coal men may come from various directions and yet be away from their job a minimum of time. The door is wide open, a hearty invitation is extended to every producer of coal, and everyone who comes will be amply repaid. Remember, the place is Music Hall, Cincinnati; the date is May 13-14-15-16-17—five days of major opportunity.

An Interesting Change

whether you just hope to be; whether you are now cleaning your coal, or just contemplating it; whether you have adopted mechanical methods of production, or are just looking at it as an interested spectator, if you are producing coal, you will find many, many things on the program for the Cincinnati meeting that will be of genuine interest and help. Mr. Paul Weir, chairman of the Program Committee, and the members of his committee, have earnestly tried to give the industry what it wants.

Big Trees and the Acorn

"BIG trees from little acorns grow," is an axiom learned early. The group of manufacturers who sponsored the first convention and exposition of mining equipment, planted the little seed, which, through the proper training under The American Mining Congress, has grown into the mighty tree. The Manufacturers Division of that great organization may well be proud of its effort, and may point with pride to the great institution that has grown through cooperative effort.

At the exposition about to be held, more than a 35 percent increase in the amount of space is recorded. The exposition, at first the product of a few far-sighted manufacturers, has grown to include more than 100 companies. The whole cycle of coal production is shown in the exhibits. This year a preponderance of the space is given over to the loading machine, conveyor, scraper, pit car loader, etc. With mechanization has come improved tracks, larger mine cars, more complete electrification; lubricating problems have increased with the use of more machinery, and greater power problems have confronted the operator. Manufacturers have been in the front line procession of advancement. They have offered, and are offering, to the operators who come to Cincinnati this year expert service in solving their operating problems "Safely, efficiently and profitably."

The Rocky Mountain Coal Mining Institute

THE Rocky Mountain Coal Mining Institute held its annual convention in Salt Lake City last month and was very well attended by men representing a large proportion of the coal mining companies in that section of the country. Two major subjects were discussed—safety and mechanization. The selection of these two topics is a direct indication of what is uppermost today in the minds of coal mining

men and the attendance at the convention is an accurate barometer of the intense interest with which these two subjects are being studied. The number of papers and discussions which were presented and the material which these papers contained show the extent to which mechanized mining is being adopted by the coal mines in the Rocky Mountain Field. The progress being made in the western mines forms a valuable contribution to the development of coal mine mechanism and the Rocky Mountain Institute is to be sincerely congratulated on its program which so clearly brought this forth.

The Value of Advertising

ADVERTISING is the open door through which small but progressive enterprises project themselves into national and international commerce. It is the agency through which increased consumption is developed. Without advertising no business enterprise could get far beyond the region in which it is located. With intelligent advertising no valuable article can fail to reach wider and still wider markets.

It may be questioned as to the value a full page picture of an Egyptian goddess may have as an influence in soliciting trade but if the design of that Egyptian goddess is so well executed as to command the eye and attention of the reader, it has served the purpose even if it goes no further than to call attention to the firm which makes the presentation.

There are, however, some advertisements which without the so-called lure tell a story which commands attention. Among these is an announcement which is being distributed by the Denver and Rio Grande Western Railroad Company and the Utah Coal Producers Association, which is an editorial in itself and which we reproduce as an excellent example of good advertising. It points out the importance of the industry to the state in such a way as to leave a clear and definite expression of its value. We quote:

"Visualize 21 divisions of the A. E. F., each 28,000 strong, marching eight abreast down Main Street of Salt Lake City. It would take 60 hours for such an army to pass a given point. There you have a picture of the numerical strength of the army of men mining bituminous coal in this country. Again visualize if you can a train of 10,396,000 50-ton railroad cars; this train would reach $3\frac{1}{2}$ times around the earth, and you will have a picture of the railroad equipment necessary to move the bituminous coal produced last year by this great army of men.

"It is estimated that the present value of bituminous coal lands, plants and equipment in the United States is $11\frac{1}{2}$ billion dollars.

"The bituminous industry in this country has continuously furnished its trade with the cheapest fuel of any place in the world. Efficient operation reflected by a rapidly growing program of a mechanization largely accounts for these low prices which in turn are responsible for the industrial prosperity of this country. Of the total energy developed last year in this country more than 65 percent of it was the result of burning coal. There was produced last year in this country 517,563,352 tons of bituminous coal.

"The State of Utah contains 10 times as much coal as has already been mined in the entire United States up to the present time. The United States Bureau of Mines reports show that Utah contains 196 billion tons of coal."

Legislation De Luxe

THE Seventieth Congress considered approximately 27,000 bills, resolutions, etc. It enacted into law 1,035 of these measures. In addition, the state legislatures have been in session. It has been estimated that the number of suggestions before those legislative bodies directly affecting domestic business in one way or another will total 60,000. This flood has been over a period of a few months, and the National Congress is again in session, but even at that, why worry about it or the statement of James A. Emery, of the National Manufacturers Association, that "we have the largest, if not the most efficient, law factory in the world, and we enact more legislation in the United States, in state and national legislatures, than is proposed in the legislatures of the first five European powers."

In comparison, it is interesting to note that Latvia, with an area equal of that of West Virginia, has 26 political parties. France, with 18 political parties, has changed her government 12 times in 2 years. The United States has 50 religions, 60 nationalities and 40 languages, yet we are the greatest nation in the tide of time. Under no other form of government could industrial relations reach so high a plane as ours, even though we do suffer from epidemics of legislation.

Why this demand for laws? At what behest do members of our legislatures flood the country with proposed and actual rules governing business and personal conduct? Why should we be compared unfavorably in this respect with our foreign friends? Are we less capable of governing ourselves? Do we need guardians of the law? Are we incompetents?

Our answer is, of course, that we are none of these things. We are the greatest nation on earth—admittedly so by the very powers with whom we are being unfavorably compared. Have we grown to our present stature *because* of the wise safeguards placed about us, or *in spite* of them?

It is our firm contention that legislatures, state or national, are responsive to the demand of the people. If they present innumerable laws, it is because the people demand them. Selfish people, perhaps; people actuated by the desire to do good for the masses; but nevertheless the demand is there, and with sufficient force to get responsive action.

The cure then is not to rail at the legislatures, but to carry the question of over-lawing the Nation to the people. In the final analysis, that is where the blame and the cure rest. We need neither legislation nor agitation to assist in the march of industrial progress. The will of the American people to maintain our present standard of living, as against Old World servitude and pauper labor, all combine to smoothen the path of industry.

The Door of Opportunity

ONE of the clearest statements against government in business was presented by Calvin Coolidge, when he said: "You want your earnings and your property secure. You want a free and fair opportunity to conduct your own business and make your own way in the world without danger of being overcome by a government monopoly. When the Government goes into business it lays a tax on everybody else in that business, and uses the money that it collects from its competitors to establish a monopoly and drive

them out of business. No one can compete. When the government really starts a line of business, that door of opportunity is closed to the people. It has always been an American ideal that the door of opportunity should remain open."

This is a sound declaration of American principle that is in danger of being overthrown in one way or another. The twisted view of the bureaucrat closes that door of opportunity which has been the secret of American greatness. That door should be guarded as a precious possession, and every effort to close it to individual initiative in favor of government supervision or control should be thwarted.

The President and Congress

THE extent to which President Hoover may expect the cooperation of his Congress doubtless will be demonstrated by the action of Congress on the proposed farm relief bill and on tariff revision. It appears now that there is a group of members in both Houses who are ready to insist upon the adoption of their views over the views and convictions of the President. Whether or not they will be successful in winning over a majority of both Houses remains to be seen.

The President has indicated to Congress that he intends to respect the dividing line between the legislative and executive branches of the Government. He has emphasized his conviction that the responsibility for framing new legislation rests with Congress, and that he is not disposed to pass upon legislation in the making, but rather will wait until it is brought to him in the form agreed upon by the legislative branch. On the other hand, it is made clear by his utterances that his convictions on a given subject will be made known without equivocation when the time comes for him to act. In other words, Congress is expected by the President to perform its functions without hindrance from the executive branch; and the President is expected to perform his constitutional functions with the same consideration at the hands of Congress.

Under other Presidents, whenever important legislation was in the making, there were frequent meetings between the majority party leaders of both Houses of Congress and the Chief Executive. Frequently, there existed ample justification for the belief that the President was influencing and perhaps dictating the form and language of the legislation. From the attitude taken thus far by the President, it can be assumed that he will not give approval to any bill before it is written in its final form, and that he will not be committed in advance to any legislation which might prove embarrassing or disastrous to his administration.

During recent years Congress has shown a tendency to consider legislative proposals without regard to the question of their constitutionality or their effect upon the morale of the people; with the result that the Nation has been split up into groups with one section against another—one class of the people feeling that they have been taken advantage of for the benefit of another class. President Hoover realizes that this sort of thing can not go on without endangering the existence of the Republic and the success of constitutional government. Under his administration, it can be expected that all departments of the Government will be required to attend to their traditional and constitutionally prescribed functions.

The Industrial Development Conference

ceptional attendance of research scientists and men actively engaged in "doing things."

Among them was Mr. B. G. Klugh, of Birmingham, who spoke on the necessity for extensive research, and who quoted one classic instance of results of German research on American industry:

A certain German company buys phosphate rock in Florida, ships it to Hamburg, and then a 145 mile rail and canal haul to Piestoritz. At that place they are mining lignite of only 4,000 B. t. u. hauling it direct to the boilers, generating steam—electric power, which is used in four 10,000-K. v. a. furnaces, with which along with the phosphate rock, they manufacture both phosphorus and phosphoric acid. At Leunawerke, is the largest synthetic ammonia plant in the world. This ammonia has its hydrogen produced from water gas by means of coke which has already stood a 250 mile freight haul. The hydrogen is combined with nitrogen from the same kind of air we breathe here, into synthetic ammonia. This ammonia is then taken to Piestoritz, combined with the phosphoric acid just mentioned, into di-ammonium phosphate, which is made into concentrated fertilizing materials, a main constituent of which is phosphoric acid, which is then shipped back to the United States, where the phosphate rock came from, and sold at a profit.

This shows courage and vision, and a proper valuation on constructive research. We shall continue to pay tribute unless we also proceed with constructive industrial research to an even greater degree.

The conference was replete with forceful and helpful discussions, and marked a distinct advance in southern industrial progress.

The Special Session

ON APRIL 15 a special session of the Seventy-first Congress convened on call of President Hoover. Its expressed purpose is for the enactment of limited tariff revision, agriculture relief, census and reapportionment legislation. In this issue, the "Legislative Review" indicates that Congress has no intention of sticking to these presidentially prescribed tasks. The House has tried to prevent hungry Congressmen from going far afield by appointing only members of such committees as will deal with the subjects under consideration. But no such restriction is placed around the Senate, which is a continuing body. Many new faces are in evidence, and these new Senators and Representatives will necessitate many changes in Senate and House Committees. It is apparent that the House committees will not be appointed during the special session.

There is much talk of being able to adjourn by the first of July, but little hope is actually held out for such a result. The mining industry found itself well to the forefront in legislation either re-introduced or newly proposed, although it is not anticipated that there will be any action taken on any legislation affecting mineral production, aside from that in connection with consideration of the tariff.

This may be a banner special session. Certainly Congress has an excellent opportunity to make a name for itself that will go down in history alongside the ride of Paul Revere.

Government By Commission

THE New York Journal of Commerce pertinently asks if there is no better method of procedure in relation to anti-trust matters, than that established through the Federal Trade Commission in its "Code of Trade Ethics," under which it feels that industry is rapidly being subjected to government by commission.

The Federal Trade Commission during recent years has held a considerable number of conferences with the leaders of various business groups relative to trade practice, from which have been developed these codes which have been approved and announced by the commission. Violations of such voluntary codes are treated by the commission as unfair methods of competition, and thus, for practical purposes, are a part of the law of the land.

There has long been a feeling that the Federal Trade Commission has an ambition to become a dictator, rather than an arbiter in trade disputes. These "codes" launch them farther along their way, if that is their goal, because it makes them a partner with those in a given trade who have set up a code of rules which it approves for the conduct of certain trade practices and activities, and the nemesis of anyone engaged in that trade, who for any reason refuses to subscribe to the so-called voluntary code.

Commission rule has not met with any appreciable approbation from industry. Yet there is a growing tendency in Congress to set up commissions or similar tax spending agencies, which once created immediately become aggressive in their desire to control, or direct, industry. Such form of "Commission Government" as is exemplified by the present trend of the Federal Trade Commission may easily become autocratic.

It is our belief that any commission, created as an aid to industry, will do well to adhere to a policy that is guided by the needs and views of the consuming public, as well as by the needs and views of the trades whose codes have been approved by them. We are not in favor of commissions, but since they must be tolerated as an existing evil, they should be restricted to fact-finding agencies. Industry does not need a policeman.

Limited Tariff Revision

THE President in his recent message to Congress favored limited tariff revision. By that he means that there were certain adjustments necessary in order to meet existing conditions. By existing conditions is meant destructive competition from imported articles and material whereby domestic industries are unable to thrive and prosper. We believe the President means just that. In other words, the holes in and weaknesses of the existing tariff law should be patched up and strengthened.

A tariff act by this Congress that does not take care of going domestic industries that are fully capable of supplying the needs of domestic consumption, that embodies changes which represent the selfish interest of a particular section of the country as against the interests of the country as a whole, certainly will not have the approval of the people and we do not believe it will meet the views of the President.

The new tariff bill will be carefully analyzed by representatives of those domestic industries that have in good faith presented their cases in an orderly manner to the Ways and Means Committee, and have laid their cards on the table, so to speak, in accordance with the announcement and invitation of the committee issued last December.



Robert E. Tally
President of The American Mining Congress



Blank & Steller

James F. Callbreath
Secretary of The American Mining Congress



H. A. Buzby
Chairman of Manufacturers Division,
The American Mining Congress



Paul Weir
Chairman, Program Committee
Sixth Annual Convention
Practical Coal Operating Men

ANNUAL CONVENTION of Practical Coal Operating Men

PAUL WEIR, Chairman of Program Committee of 60 operating men, arranges splendid program—Papers covering all production problems from face to tippie to be presented—Exposition of mine equipment of unusual proportions to supplement discussions.

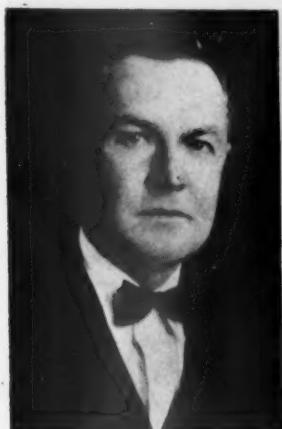
"SAFE, Efficient, Profitable Production" has become the fixed slogan for the annual conventions of Practical Coal Operating Officials, held under the auspices of The American Mining Congress. These meetings have become a national institution, and the 1929 meeting, which marks their sixth anniversary, promises to surpass anything heretofore attempted both in the way of discussions and in the National Exposition of Mine Equipment, which has been an outstanding feature of the event. The discussions arranged for are industry wide and cover all operating problems from face to tippie.

The program committee has departed from the usual form for these conventions and has arranged for the presentation of the full cycle of mining at six of the sessions. Each of these sessions will attempt to discuss the more important

phases of production in each of six coal-producing districts. For instance, one session will discuss anthracite problems, another will center about production problems in Illinois, Indiana and West Kentucky; another about the far West; and still others around problems in southern West Virginia, Virginia, eastern Kentucky, Tennessee and Alabama, and Pennsylvania and Ohio, and the southwestern field. There will be eight major sessions, with a number of special committee meetings, dinner conferences and luncheon discussions. One session will be devoted to safety, another to the progress in mechanization. The latter session is under the direction of the National Committee on Mechanized Mining, and is expected to present some interesting data gathered by the committee since its organization last June. Dr. L. E. Young, vice president of the Pittsburgh

Coal Company, is chairman of this national committee and will present a review of its activities.

Developments in coal-mining methods during the last year have been striking. The industry is rapidly going from hand to machine methods. The National Committee on Mechanized Mining reports that the proportion of output loaded mechanically runs from 10 to 40 percent in various states and is gaining steadily. Many states have reported remarkable advance in mechanical production, and as yet the field is but scratched. About 2,000 coal mines produced approximately 500,000,000 tons of coal in 1928, and of this number something like 10 percent were mechanized. The figures to be presented at the opening session will be astounding to many, and will show the definite trend toward the adoption of the machine as against hand loading.



T. J. Thompson
Arkansas



F. G. Morris
Alabama



G. P. Bartholomew
Colorado



F. W. Whiteside
Colorado



*Robert McAllister
Colorado*



*J. E. Jones
Illinois*



*Chester C. Wilcoz
Illinois*



*H. A. Treadwell
Illinois*



*F. S. Pfahler
Illinois*



*David Ingle
Indiana*



*Charles Gottschalk
Indiana*



*J. R. Henderson
Indiana*



*L. C. Skeen •
Kentucky*



*R. E. Galbreath
Kentucky*



*W. C. Snyder
Maryland*



*J. J. Rutledge
Maryland*

Members of the Program Committee



Frank A. Young
New Mexico



Horace Moses
New Mexico



W. D. Brennan
New Mexico



Ezra Van Horn
Ohio

Six papers will be presented during the convention, which will describe the complete mining operation of a mechanized property, and will discuss drilling, blasting, transportation, cleaning, power—in fact, all phases of production in their relation to concentrated mining.

Six papers will be presented which will review the developments in as many coal-producing districts. Papers will present conveyor, scraper, and loading machine operations; mining in pitching seams; on long faces; rock gangways under heavy pitch and rock disposal; maintenance and inspection of equipment; drainage and pumping; haulage; roof jacks; and ventilation. Strip mining will come in for discussion, one paper dealing with the problems in handling 25- to 50-foot strip and one presenting the complete operation of a strip property; another will present cleaning in relation to strip coal. A number of papers will be presented on coal cleaning, and a number of new plants will be described.

A question that has come up for a lot of discussion is that of the accident hazard of concentrated mining. This subject will be a feature of the sessions on Safety, as will be Safety Courts, Underground Inspections and Modern Mine Ventilation.

A group of distinguished operators will act as chairmen of the sessions including: Otis Mouser, president, Stonega Coke and Coal Company; J. B. Warriner, vice president and general manager, Lehigh Coal & Navigation Company; H. N. Taylor, president, United States Distributing Corporation; J. B. Pauley, chairman of the board, Miami Coal Company; Alex Bonnyman, chairman of the board, Diamond Coal Company; M. D. Cooper, assistant general superintendent, Hillman Coal & Coke Company; W. L. Robison, vice president, Youghiogheny and Ohio Coal Company; and J. G. Puterbaugh, president, McAlester Fuel Company.

The convention will officially open on Monday morning at 9 o'clock with inspection

of the exposition and registration of delegates. This gives the delegate sufficient time to get settled at his hotel, visit with his friends and to make his first inspection of the exhibition. The opening session of the convention will convene at 2 p. m., when Mechanization will be the topic under discussion. This opening session will be world wide in its survey, and will include papers on mechanization growth in other countries. From the opening session to the close of the convention the program sustains interest and offers an unusual opportunity to become familiar with the most recent mining practice in the industry.

Members of the program committee, cooperating with Mr. Paul Weir, vice president and general manager, Bell & Zoller Coal & Mining Company, who is their chairman, are:

Alabama—Frank G. Morris, G. L. Chamberlin, Charles F. Debardeleben, Jr., and Morris W. Bush.



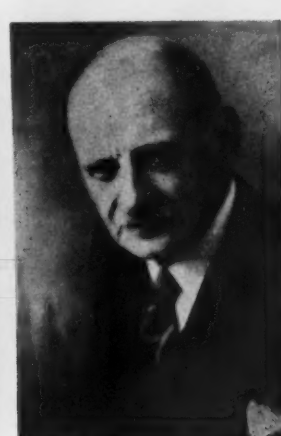
Cadwallader Evans, Jr.
Pennsylvania



R. Y. Williams
Pennsylvania



B. H. Stockett
Pennsylvania



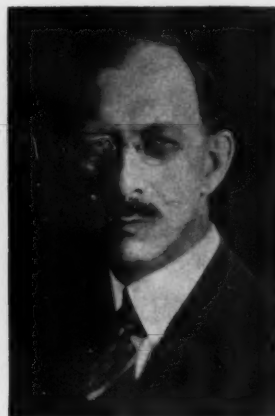
T. R. Johns
Pennsylvania



T. F. McCarthy
Pennsylvania



E. J. Newbaker
Pennsylvania



L. E. Young
Pennsylvania



Percy C. Madeira
Pennsylvania



W. L. Affelder
Pennsylvania



C. E. Abbott
Tennessee



Otto Herres
Utah



I. N. Bayless
Utah



G. T. Stevens
Virginia



George Watkin Evans
Washington



Thomas G. Fear
West Virginia



J. D. Francis
West Virginia

Members of the Program Committee



Edward Graff
West Virginia



H. B. Husband
West Virginia



Thomas H. Clagett
West Virginia



C. L. Chapman
West Virginia

Arkansas—Heber Denman and T. J. Thompson.

Colorado—G. P. Bartholomew, Robert McAllister, R. M. Perry, and F. W. Whiteside.

Illinois—J. E. Jones, H. A. Treadwell, Paul Weir, Moses F. Peltier, F. S. Pfahler, and C. C. Wilcox.

Indiana—David Ingle, Charles Gottschalk, and J. R. Henderson.

Kansas - Missouri - Oklahoma — J. G. Puterbaugh.

Kentucky—L. C. Skeen, R. E. Galbreath, and T. E. Jenkins.

Maryland—W. C. Snyder and Dr. J. J. Rutledge.

New Mexico—Frank Young, H. D. Moses, W. D. Brennan, and O. Huber.

Ohio—R. L. Ireland, W. L. Robison, and Ezra Van Horn.

Pennsylvania (Anthracite)—J. B. Warriner, Cadwallader Evans, R. Y. Williams, and B. H. Stockett.

Pennsylvania (Bituminous)—T. R. Johns, T. F. McCarthy, S. W. Blakslee,

E. J. Newbaker, Dr. L. E. Young, Percy C. Madeira, and W. L. Affelder.

Tennessee—Hugh P. Finley and C. E. Abbott.

Utah—Otto Herres and I. N. Bayless.

Virginia—G. T. Stevens.

West Virginia—Thos. G. Fear, J. D. Francis, Edward Graff, H. B. Husband, Thos. Clagett, and C. L. Chapman.

Washington—Geo. Watkin Evans.

Wyoming—F. V. Hicks, Edw. Bottomley, and Gomer Reese.

These meetings have a reputation for being predominantly "business sessions." It is at once apparent that this group of some 3,000 men attend these meetings to learn and to give constructive help to their fellow operators. The sessions are always well attended and the exposition is continuously under inspection. But in spite of the fact that the five-day period is crowded, much time is set aside for entertainment. This year the program committee has attempted to leave as many free evenings as possible, in

order that the delegates may arrange their own parties. Two events of special importance have been arranged, one of which is the annual informal dinner. In previous years it has been attempted to make these dinners semiserious, and to present at least one topic for serious discussion. The committee this year has completely discarded that idea. The dinner will be entirely entertainment, and no attempt will be made to give it a serious air. There positively will be no speech making. No speakers are listed on the program. Instead, an excellent dinner is being arranged, to be followed by a special entertainment, which will include a musical program, dancers, blues singers, a minstrel number, etc. The program will be presented as "The Mining Congress Nite Club Review," and will be arranged to "beguile the tired coal operator." Dancing, with the famous Cincinnati Club Orchestra, will close the entertainment. The management has arranged with the Cincinnati Conservatory



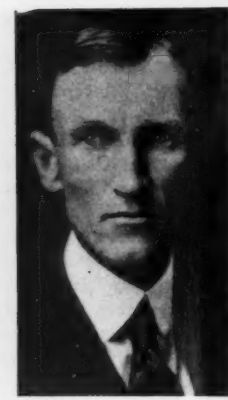
Edward Bottomley
Wyoming



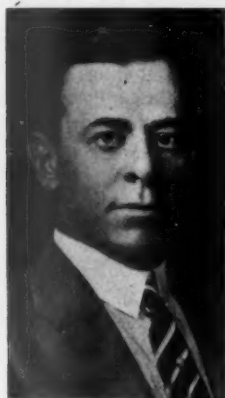
F. V. Hicks
Wyoming



Gomer Reese
Wyoming

*Newell G. Alford**Lee Long**G. B. Southward**F. G. Tryon**L. D. Anderson**C. L. Lutton**E. J. Christy**R. L. Adams**R. S. Walker**D. A. Thomas**R. M. Watt**J. E. Edgeworth**D. A. Stout**E. K. Davis**H. D. Kynor*

Some of the Men Who Are to Present Papers to the Convention



C. C. Whaley
Vice Chairman



N. S. Greensfelder
Honorary Chairman



F. J. Maple
Vice Chairman



H. K. Porter
Honorary Chairman

Representatives of the Manufacturers Division



J. C. Wilson
Honorary Chairman

of Music and the Cincinnati School of Music to permit a group of their pupils to attend as guests, thus eliminating the scarcity of ladies heretofore a drawback to the dances.

Another feature of the meeting will be the dinner conference on "Mining Engineering Education," to which have been invited the deans of the leading mining schools and a group of operators especially interested in solving the problem of obtaining young engineers in the industry. Officials of the Bureau of Mines and officers of the American Institute of Mining and Metallurgical Engineers will be present to participate in this discussion. It is hoped that this conference will suggest some plan whereby the mining schools may interest more young men in their courses, in order that the industry may be assured of a continuous supply of trained engineers.

Meetings have been arranged for various committees of the National Standardization Group of the American Mining Congress, which will include a special dinner conference on Coal Mine Drainage. This committee, under the leadership of W. E. Housman, of the H. C. Frick Coke Company, has under advisement a national code on this sub-

ject, and the committee will consider the second draft of the proposed code. None of these meetings will at any time conflict with the regular sessions of the convention, and a special effort has been made to avoid any duplication of time.

Golf privileges will be accorded the delegates by the members of the Cincinnati Coal Exchange, and special arrangements are being made to look after the ladies. Bring them along. Lunches, teas, and sight-seeing trips will be arranged for them.

THE NATIONAL EXPOSITION

The National Exposition of Mine Equipment has long been a feature of these meetings. The convention itself is sponsored by the Manufacturers' Division of the American Mining Congress, of which H. A. Buzby, president of the Keystone Lubricating Company, is chairman. Members of this division include representatives of the following companies:

Honorary Chairmen

N. S. Greensfelder, Hercules Powder Co., Wilmington, Del.
J. C. Wilson, Ohio Brass Co., Mansfield, Ohio.
H. K. Porter, Hyatt Roller Bearing Co., Harrison, N. J.

Chairman

H. A. Buzby, Keystone Lubricating Co., Philadelphia, Pa.

Vice Chairmen

C. L. Herbster, Hockensmith Wheel & Mine Car Co., Penn. Pa.
F. J. Maple, John A. Roebling's Sons Co., Trenton, N. J.
Charles C. Whaley, Myers-Whaley Co., Knoxville, Tenn.

Members

American Car & Foundry Co., New York City. H. C. Wick.

Atlas Powder Co., Wilmington, Del. G. S. Scott.

Automatic Reclosing Circuit Breaker Co., Columbus, Ohio. C. M. Hickle.

Bethlehem Steel Co., Bethlehem, Pa. S. H. Yorks.

Brown-Fayro Co., Johnstown, Pa. E. F. Austin, Pittsburgh, Pa. Carnegie Steel Co., Pittsburgh, Pa. R. L. Twitchell.

Central Frog & Switch Co., Cincinnati, Ohio. E. R. Heitzman.

Cutler-Hammer Mfg. Co., Milwaukee, Wis. F. U. Webster.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. E. F. Carley.

Edison Storage Battery Co., Orange, N. J. G. E. Stringfellow.

Electric Railway Equipment Co., Cincinnati, Ohio. A. L. Johnston.

Enterprise Wheel & Car Corp., Bristol, Va.-Tenn. C. P. Daniel.

Fairbanks, Morse & Co., Chicago, Ill. G. J. Podlesak.

General Electric Co., Schenectady, N. Y. L. W. Shugg.

Hendrick Mfg. Co., Carbondale, Pa. B. G. Shotton.

Hercules Powder Co., Wilmington, Del. N. S. Greensfelder.



C. L. Herbster
Vice Chairman

Hockensmith Wheel & Mine Car Co.,
Penn. Pa. C. L. Herbst.

Robt. Holmes & Bros., Inc., Danville,
Ill. Grant Holmes, president.

Hyatt Roller Bearing Co., Harrison,
N. J. H. K. Porter.

Jeffrey Mfg. Co., Columbus, Ohio.
Robert Jeffrey.

Keystone Lubricating Co., Philadel-
phia. Pa. H. A. Buzby.

A. Leschen & Sons Rope Co., St. Louis,
Mo. L. H. Gault.

Link-Belt Co., Chicago, Ill. A. J.
Sayers.

Ludlow-Saylor Wire Co., St. Louis,
Mo. Duncan Meier.

McGraw-Hill Publishing Co., New
York City. Ralph C. Becker, vice presi-
dent.

Mancha Storage Battery Locomotive
Co., St. Louis, Mo. Raymond Mancha.

Mine Safety Appliances Co., Pitts-
burgh, Pa. J. T. Ryan.

MECO, Incorporated, Baltimore, Md.
Clarence R. Claghorn.

Myers-Whaley Co., Knoxville, Tenn.
William A. Whaley.

Morse Chain Co., Ithaca, N. Y. C. L.
Saunders.

National Carbon Co., Inc., Cleveland,
Ohio. E. A. Williford.

Ohio Brass Co., Mansfield, Ohio. J. C.
Wilson.

Phillips Mine & Mill Supply Co.,
Pittsburgh, Pa. J. Milton Duff.

Roberts and Schaefer Co., Chicago, Ill.
Col. W. R. Roberts.

John A. Roebbling's Sons Co., Trenton,
N. J. F. J. Maple.

Simplex Wire & Cable Co., Chicago,
Ill. A. Hagen.

S K F Industries, Inc., New York City.
R. C. Byler.

Southern Wheel Co., St. Louis, Mo.
F. C. Turner, vice president, 1308 Key-
stone Bldg., Pittsburgh, Pa.

Streeter-Amet Weighing & Recording
Co., Chicago, Ill. H. F. Reck.

Sullivan Machinery Co., Chicago, Ill.
S. B. King.

Timken Roller Bearing Co., Canton,
Ohio. E. R. Phillips.

W. S. Tyler Co., Cleveland, Ohio. G. R.
Delamater.

Watt Car & Wheel Co., Barnesville,
Ohio. H. H. Watt.

Weir Kilby Corp., Cincinnati, Ohio.
J. K. Lansdowne.

Westinghouse Electric & Mfg. Co.,
East Pittsburgh, Pa. P. H. Grunnagle.

The 1929 exposition is by far the
finest yet arranged for. More manufac-
turers have taken space, and the entire
exposition is about 35 percent larger
than any previous exhibit, and will in-
clude an astounding variety of equip-
ment, from grease to loaders; from trol-
ley hangers to substations; from the
smallest accessory to the largest unit of
equipment. Conveyors, scrapers, loaders,



Otis Mouser

*Director of the American Mining Con-
gress, will preside at the opening session
of the convention*

pit car and mechanical, pumps, coal-
cleaning equipment, bearings—in fact,
everything that goes into the “safe,
efficient, profitable production” program
for coal extraction—will be on display.
Better than 40,000 sq. ft. of floor space
will be utilized, and a great deal of the
equipment will be in actual operation. A
special attempt has been made to segre-
gate the quiet and noisy exhibits by dis-
tributing the operating exhibits between
the two halls and restricting their area.

All sessions of the convention will be
held in the theater, which is located be-
tween the two halls. Special effort will
be made to provide amplification so that
speakers may easily be heard from any
part of the room. Registration, head-
quarters for the convention manager and
the director of exhibits, headquarters for
the program committee, etc., will all be
housed in the lobby. The usual staff
from the Washington office will be in
charge of registration and everything
possible will be done to make the meeting
a big success.

Through the courtesy of the General
Electric Company of Schenectady, N. Y.,
the exposition will again be under the
direct management of L. W. Shugg, who
has been director of exhibits for the last
two exhibitions. This insures a smooth-
running exposition and a perfection in
handling that has distinguished these
events. Mr. Shugg brings to the exposi-
tion a wide experience, not only with his
company but as director of exhibits for
the National Electric Light Show, and
as representative of his company upon
the boards of many of the leading indus-
trial associations.

A list of the manufacturers partici-
pating in the exposition follows:

Alberg Bearing Co., Chicago, Ill.;
Allen and Garcia Co., Chicago, Ill.;
American Car and Foundry Co., New
York; American Rolling Mill Co., Mid-
dletown, Ohio; Atlas Powder Co., Wil-
mington, Del.; Automatic Reclosing Cir-
cuit Breaker Co., Columbus, Ohio.

Bethlehem Steel Co., Bethlehem, Pa.;
Bonney Floyd Co., Columbus, Ohio;
Boyts, Porter & Co., Connellsville, Pa.;
Brown Fayro Co., Johnstown, Pa.; Bur-
ton Publishing Co., Chicago, Ill.

Carnegie Steel Co., Pittsburgh, Pa.;
Chance Coal Cleaner, Scranton, Pa.;
Chicago Auto. Conveyor Co., Chicago,
Ill.; Chicago Pneumatic Tool Co., New
York City; Coal Mine Equip. Sales Co.,
Terre Haute, Ind.; Conveyor Sales Co.,
New York, N. Y.; Covington Machine
Co., Covington, Va.; Crowe Mfg. Co.,
Cincinnati, Ohio.

Deister Concentrator Co., Fort Wayne,
Ind.; Deister Machine Co., Fort Wayne,
Ind.; De Walt Products Corp., Leola,
Pa.; Duff Norton Mfg. Co., Pittsburgh,
Pa.; Duncan Foundry & Machine Co.,
Alton, Ill.; E. I. du Pont de Nemours &
Co., Wilmington, Del.

Eagle Iron Works, Des Moines, Iowa;
Edison Storage Battery Co., Orange,
N. J.; Egyptian Iron Works Co., Mur-
physboro, Ill.; Electric Railway Equip-
ment Co., Cincinnati, Ohio; Electric
Railway Improvement Co., Cleveland,
Ohio; Electric Storage Battery Co.,
Philadelphia, Pa.; Enterprise Wheel &
Car Corp., Bristol, Tenn.-Va.

Fairbanks, Morse & Co., Chicago, Ill.;
Flood City Brass & Electric Co., Johns-
town, Pa.

General Electric Co., Schenectady,
N. Y.; Goodman Mfg. Co., Chicago, Ill.;
Graybar Electric Co., New York City.

Hazard Wire Rope Co., Wilkes-Barre,
Pa.; Hendrick Mfg. Co., Carbondale,
Pa.; Hercules Powder Co., Wilmington,
Del.; Hockensmith Wheel & Car Co.,
Penn. Pa.; Holstein, P. W., Columbus,
Ohio; Hyatt Roller Bearing Co., Harri-
son, N. J.

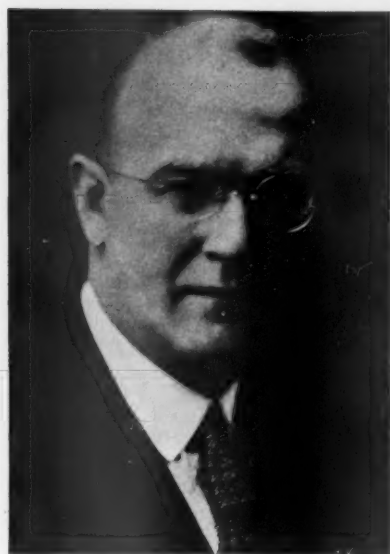
Ideal Commutator Dresser Co., Sycam-
ore, Ill.; Ironton Engine Co., Ironton,
Ohio.

Jeffrey Mfg. Co., Columbus, Ohio; Joy
Mfg. Co., Franklin, Pa.

Keystone Lubricating Co., Philadel-
phia, Pa.; Koppers-Rheolaveur Corp.,
Wilkes-Barre, Pa.

Leschen & Sons Rope Co., A., St. Louis,
Mo.; Lincoln Steel & Forge Co., St.
Louis, Mo.; Link-Belt Co., Chicago, Ill.

Macwhyte Co., Kenosha, Wis.; Mancha
Storage Battery Loco. Co., St. Louis,
Mo.; Martin Co., H. D., Cincinnati, Ohio;
McGraw Hill Publishing Co., New York,
N. Y.; Mine Safety Appliances Co.,
Pittsburgh, (Continued on page 340)



J. B. Warriner
A director of the Mining Congress, and
chairman of the morning session of
May 14



Harry N. Taylor
Chairman of the third session, Tuesday
afternoon, May 14



J. B. Pauley
Chairman of the morning session, Wed-
nesday, May 15

PROGRAM

SIXTH ANNUAL CONVENTION OF PRACTICAL COAL OPERATING MEN

MONDAY, MAY 13

2 P. M.

STATUS OF MECHANIZATION IN 1929

*(Session under auspices of National Committee
on Mechanized Mining)*

CHAIRMAN: OTIS MOUSER
President, Stonega Coke and Coal Company

"Mechanized Mining at the Advent of 1929"

*By DR. L. E. YOUNG, Vice President, Pittsburgh
Coal Company.*

"Practical Application of Mechanization in Coal Production"

*By G. B. SOUTHWARD, Mechanization Engineer,
The American Mining Congress.*

"Statistics on Mechanical Mining"

*By F. G. TRYON, Head, Statistics Section, Coal
Division, United States Bureau of Mines.*

"Trend of Mechanized Mining in the British Isles"

*By J. A. S. RITSON, Professor of Mining, Dept.
of Mining, The University, Leeds, England.*

FORMAL MEETING OF THE NATIONAL
COMMITTEE ON MECHANIZED MINING.



Alex Bonnyman
Chairman of the afternoon session
May 15



W. L. Robison
Chairman of the afternoon session of
May 16



J. G. Puterbaugh
Chairman of the morning session of
May 17

TUESDAY, MAY 14

9 A. M.

CHAIRMAN: J. B. WARRINER,
Vice President and General Manager,
Lehigh Coal & Navigation Company

"Recent Developments in Anthracite Mining"

By H. D. KYNOR, Manager, Northumberland Mining Company.

"Rock Gangways Under Heavy Pitch"

By E. P. HUMPHREY, Gen. Mgr., Hazle Brook Coal Company.

"Rock Disposal in the Anthracite Field"

By J. LATIMER LEE, Mining Engineer, Susquehanna Collieries Company.

"Scraper Mining at the Scranton Coal Company"

By E. W. LAMB, Assistant General Superintendent, Scranton Coal Company.

"Coal Cleaning at Marvine Breaker, Hudson Coal Company"

By CADWALLADER EVANS, JR., Gen. Mgr., Hudson Coal Co.

2 P. M.

CHAIRMAN: H. N. TAYLOR
President, United States Distributing Corp.

"Recent Developments in Mining Methods in Colorado, Wyoming, New Mexico, Utah and Montana"

By D. A. STOUT, Chief Engineer of Mines, Colorado Fuel and Iron Co.

"Handling Labor Problems at the Stag Canon Fuel Company"

By W. D. BRENNAN, Manager, Stag Canon Branch, Phelps Dodge Corporation.

"Mining System of Sheridan-Wyoming Coal Company"

By EDW. BOTTOMLEY, General Superintendent, Sheridan-Wyoming Coal Company.

"Power at the United States Fuel Company"

By L. D. ANDERSON, Chf. Engr., United States Smelting, Refining & Mining Company.

"Methods of Mining Coal in Pitching Seams"

By GEORGE WATKIN EVANS, Cons. Coal Mining Engineer, Seattle, Wash.

"Long Face Mining with the Shaking Conveyor and the Universal Duckbill at Union Pacific Coal Company"

By J. E. EDGEWORTH, Union Pacific Coal Co.

WEDNESDAY, MAY 15

9 A. M.

CHAIRMAN: J. B. PAULEY

*Chairman of the Board, Miami Coal Co.***"Developments in Mining Methods in Illinois, Indiana and West Kentucky"***By DAVID INGLE, President and Treasurer, Ayrshire Coal Co.***"Mining System of Bell & Zoller Coal & Mining Company"***By WM. P. YOUNG, Assistant General Superintendent, Bell & Zoller Coal & Mining Co.***"Maintenance and Inspection at Chicago, Wilmington & Franklin Coal Company"***By H. A. TREADWELL, Gen. Supt., Chicago, Wilmington & Franklin Coal Co.***"Long Face Mining in Southern Illinois"***By ROY L. ADAMS, Chf. Engr., Old Ben Coal Corp.***"Coal Cleaning at M. A. Hanna Company"***By R. S. WALKER, Cons. Engr., M. A. Hanna Co.*

2 P. M.

CHAIRMAN: ALEX BONNYMAN

*Chairman of the Board, Diamond Coal Company***"Recent Developments in Mining Methods in Southern West Virginia, Virginia, Eastern Kentucky, Tennessee and Alabama"***By D. A. THOMAS, President and Treasurer, Montevallo Coal Mining Co.***"Mining System of the Consolidation Coal Company"***By L. B. ABBOTT, Div. Engr., Consolidation Coal Co.***"Training Men to Become Foremen and Superintendents"***By C. P. ANDERSON, Chief, Labor Dept., The New River Company.***"Power Problems in Relation to Bituminous Production"***By R. M. WATT, District Manager, Kentucky Utilities Company.***"Coal Cleaning at Clinchfield Coal Corporation"***By LEE LONG, Vice President, Clinchfield Coal Corporation.*

WEDNESDAY, MAY 15, 6.30 P. M.

ENGINEERING EDUCATION CONFERENCE

*A dinner meeting to be held at the Gibson Hotel.**Speaker: WM. J. KIBBY.*

THURSDAY, MAY 16

9 A. M.

CHAIRMAN: M. D. COOPER

*Assistant General Superintendent
Hillman Coal & Coke Company***"Reducing Accidents in Mechanical Loading"***By DR. L. E. YOUNG, Vice President, Pittsburgh Coal Company.***"Safety Court of the Consolidation Coal Company"***By THOS. G. FEAR, General Manager of Operations, The Consolidation Coal Company.***"Underground Safety Inspections"***By C. L. LUTTON, Safety Director, H. C. Friek Coke Company.***"Modern Mine Ventilation, Including the Use of Altimeters"***By J. A. SAXE, Chief Engineer, Ellsworth Collieries Company.*

2 P. M.

CHAIRMAN: W. L. ROBISON

*Vice President, Youghiogheny and Ohio Coal Co.***"Developments in Mining Methods in Pennsylvania (bituminous), Northern West Virginia and Ohio"***By H. W. SHOWALTER, Pres., Continental Coal Company.***"Mining System of Wheeling Township Coal Mining Co."***By E. J. CHRISTY, Consulting Engineer, Wheeling Township Coal Mining Co.***"Drainage and Pumping in the Windber Field of Berwind-White Coal Mining Co."***By E. J. NEWBAKER, General Manager, Berwind-White Coal Mining Co.***"Some Economies in Longer Mine Haulage"***By NEWELL G. ALFORD, HOWARD N. EAVENSON AND ASSOCIATES, Mining Engineers, Pittsburgh, Pa.***"Cleaning Bituminous Coal"***By E. K. DAVIS, Elec. Supt., Peale, Peacock & Kerr.*

THURSDAY EVENING, MAY 16

INFORMAL DINNER

*Roof Ball Room, Gibson Hotel, 6:30 O'clock.**Mining Congress Nite Club Review.**Dancing—10.00 p. m. to 1.00 a. m.*

FRIDAY, MAY 17

9 A. M.

CHAIRMAN: J. G. PUTERBAUGH
President, McAlester Fuel Co.

"Developments in Mining Methods in the Southwestern Field"

By J. G. PUTERBAUGH, Pres., McAlester Fuel Co.

"Long Face Operation with Caving Roof on Roof Jacks"

By FRANKLIN BACHE, President, Kali-Inla Coal Company.

"Long Wall Mining with Conveyors in the Arkansas Field"

By V. C. ROBBINS, Chief Engineer, McAlester Fuel Co.

"Problems in Handling 25- to 50-Foot Strip Mining in the Kansas-Missouri Field"

By K. A. SPENCER, In Charge of Engineering, Pittsburg and Midway Coal Mining Co.

"Complete Operation of a North Dakota Coal Strip Property"

By A. H. TRUAX, Vice Pres., Truax-Traer Coal Company.

Pa.; Mines Equip. Co., St. Louis, Mo.; MINING CONGRESS JOURNAL; MECO, Incorporated, Baltimore, Md.; Mining Safety Device Co., Bowerston, Ohio; Modern Mng. Pub. Co., Pittsburgh, Pa.; Morrow Mfg. Co., Wellston, Ohio; Morse Chain Co., Ithaca, N. Y.; Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.; Myers-Whaley Co., Knoxville, Tenn.

National Carbon Co., Cleveland, Ohio; National Conveying-Equipment Corp., Chicago, Ill.; National Malleable & Steel Castings Co., Cleveland, Ohio; Niagara Concrete Mixer Co., Buffalo, N. Y.; Norma-Hoffman Bearings Corp., Stamford, Conn.; Northern Conveyor Co., Janesville, Wis.

Ohio Brass Co., Mansfield, Ohio; Osborne Register Co., Cincinnati, Ohio.

Pennsylvania Crusher Co., Philadelphia, Pa.; Pennsylvania Mng. Machinery Corp., St. Benedict, Pa.; Phillips Mine

& Mill Supply Co., Pittsburgh, Pa.; Pittsburgh Coal Washer Co., Ambridge, Pa.; Pittsburgh Knife & Forge Co., Pittsburgh, Pa.; Portable Lamp & Equipment Co., Pittsburgh, Pa.; Post Glover Electric Co., Cincinnati, Ohio; Pure Oil Co., Columbus, Ohio.

Roberts & Schaefer Co., Chicago, Ill.; Robinson Ventilating Co., Zelienople, Pa.; Roebling's Sons Co., John A., Trenton, N. J.; Rome Wire Co., Rome, N. Y.

Safety Mining Co., Chicago, Ill.; Sanford-Day Iron Works, Inc., Knoxville, Tenn.; Simplex Wire & Cable Co., Chicago, Ill.; S. & S. Mfg. Co., Centralia, Ill.; Streeter-Amet Weighing & Rec. Co., Chicago, Ill.; Sullivan Machinery Co., Chicago, Ill.

Templeton, Kenly & Co., Ltd., Chicago, Ill.; Timken Roller Bearing Co., Canton, Ohio; Tool Steel Gear & Pinion Co., Cincinnati, Ohio; Tracy Co., Bertrand P.,

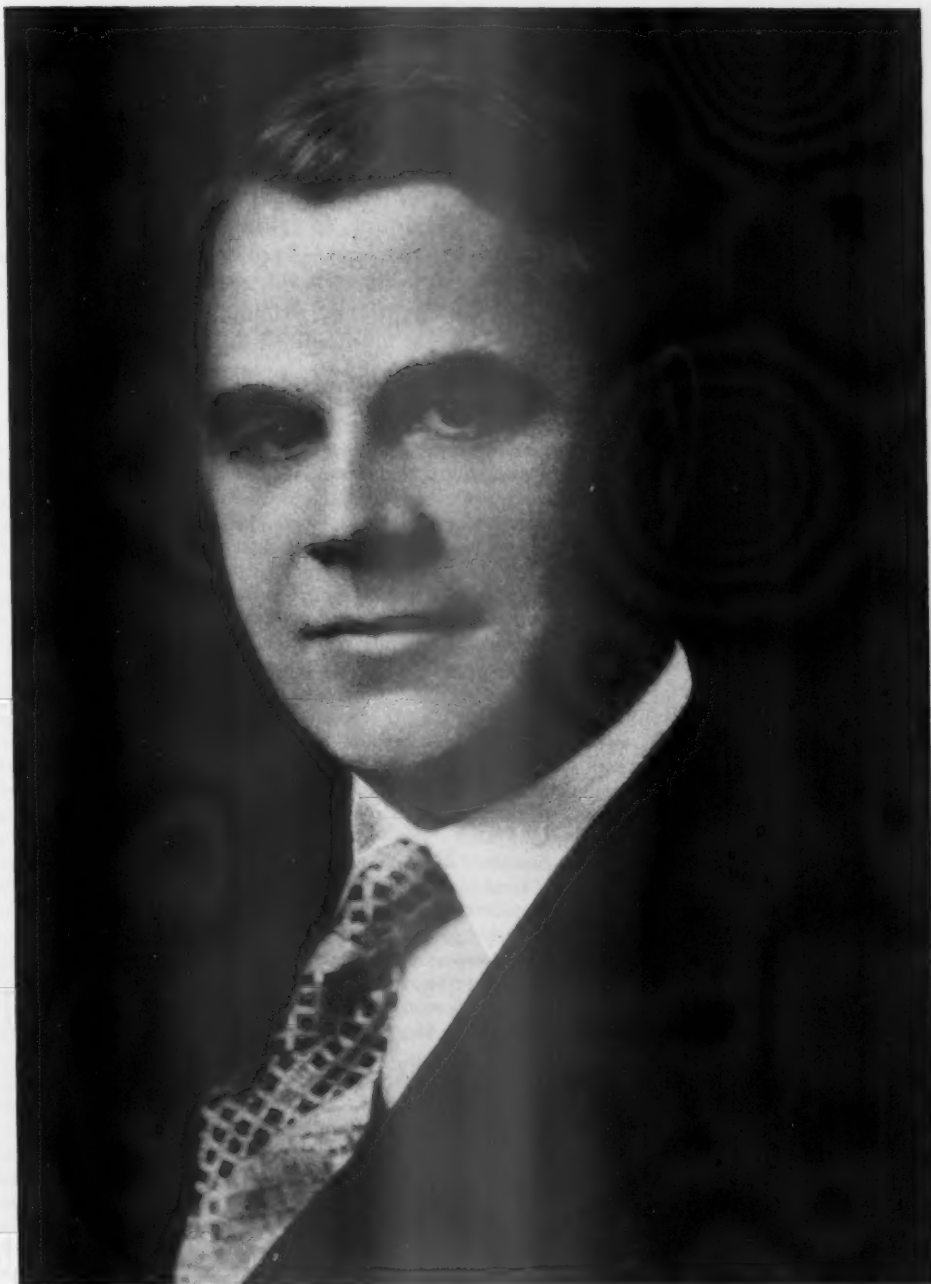
Pittsburgh, Pa.; Traylor Vibrator Co., Denver, Colo.; Tyler Co., W. S., Cleveland, Ohio.

U. S. Bureau of Mines; United Wood Treating Corp., Chicago, Ill.

Watt Car & Wheel Co., Barnesville, Ohio; Waverly Oil Works Co., Pittsburgh, Pa.; Weinman Pump Co., Columbus, Ohio; Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.; West Virginia Rail Co., Huntington, W. Va.

These conventions and expositions are real milestones in the history of progressive coal mining. Their results are written large in the advancement of the industry. They offer a marvelous opportunity to the industry from every standpoint. First, they permit the executive to learn first hand of the most advanced developments in coal-mining practice; second, they offer a free course in coal mining to the (Continued on page 354)





L. W. Shugg

*Director of Exhibits for the Sixth Annual
Convention of Practical Coal Operating Men.
Mr. Shugg's services are available through
the courtesy of the General Electric Company.*

PROFITS—

*The Basis of All Industrial Progress**

By W. L. CHURCHILL †

Profits is the basis of all industrial progress—Lowered prices do not bring desired addition to volume in highly competitive markets—Applied economics will make established enterprises profitable and automatically provide capital for industrial development—Intelligent merchandizing of primary importance

ALL industrial progress is derived from profits. Without profits we can not make material progress. The greater the profits, the greater our progress.

We are apt to overlook these economic facts in our striving to enlarge, develop, or increase industrial enterprises. Most of us have the impression that progress comes before profit. How often we are confronted with the assertion made by heads of industrial enterprises to the effect that their institution



or plant is not large enough to make money; it must have more capital with which to do a larger business before profits can be expected.

Industrial enterprises that do not earn profits can not progress except by use of profits earned by others (new capital). It is for this reason that every established enterprise should be required to operate profitably. An unprofitable industry is a retardant to progress, while profitable industries not only progress of themselves but make business for others, resulting in our general progress.

These are economic truths that need especial emphasis to those sections of our country that are seeking additional industrial enterprises. In our eagerness to obtain these enterprises we do not always insist that the new venture be established upon a basis that will insure profits to everyone concerned. As a

natural result of our failure to observe this economic requirement, many of our industrial enterprises prove a disappointment to the communities in which they have located. Oftentimes industrial enterprises show a profit but they do not expand or develop. The principal reason for this is that the profits earned have been insufficient to permit of natural growth. It is, therefore, not enough for us to know that an enterprise can operate profitably, but also that it operates with sufficient profits to enable it to keep pace with the demands of our rapidly developing Nation.

There is pouring into industrial enterprises of the United States year after year an amount of new capital that makes our total investment in manufacturing enterprises double in 10 years. A large proportion of this investment is applied to additions and improvements of established enterprises, while a smaller portion goes into new enterprises.

The established enterprises ordinarily must earn their own surplus with which to keep their plants, equipment, and products up to date and producing in the increasing quantities required by our growing demand for manufactured products. The time is not far off when manufacturing industry will be required to provide expansion and development reserves, just as today they provide for depreciation and just as our mines, oil and gas properties provide for depletion. The concern that does not provide these reserves or does not earn sufficient profits from which to obtain them can not perpetuate itself upon a permanently profitable basis.

Thus far I have alluded to new enterprises only. My purpose in this has been to reserve my major remarks for the benefit of the established enterprises after I have injected some slight warning in regard to encouraging new enterprises that have not properly equipped themselves with plans and policies that

will insure their becoming a permanent and profitable institution.

The enterprises that you already have in your various communities offer much greater opportunity for the industrial development of your communities than is generally appreciated. Make your established enterprises as profitable as they should and can be and you will accomplish two things. First, these enterprises having surpluses can and will devote a substantial proportion for the improvement of their buildings, machinery, etc. Second, being prosperous beyond their own expansion requirements, they automatically provide new capital for investment in new enterprises.

Investment in their own buildings and equipment creates business for builders, architects, engineers, and others engaged in supplying these requirements, and also tends to elevate the standards of prosperity in that community.

The surplus available for cash dividends immediately seeks service in other enterprises, and being in the hands of people familiar with these territories, the natural inclination is to invest their surplus at home.

A case in point is that of a southern manufacturer who had been earning a fair profit but not sufficient to enable satisfactory cash dividends to be paid, had his operations reviewed for the purpose of learning whether or not his earnings were in conformity with economic requirements.

The examination disclosed that profits were inadequate to insure perpetuation, and that this was caused by the products being sold at prices that were too low. It had been assumed that the low profits were due to high costs, and special efforts were being put forth to reduce these costs. These efforts had been successful, but, like the great majority of manufacturers, they had planned to pass these cost reductions on to customers by still further lowering prices on the theory

*Address delivered to the Industrial Development Conference, Atlanta, Ga., April 12, 1929.
† Industrial economist, 386 Fourth Avenue, New York, N. Y.

that the lower prices would attract additional trade and profits would follow.

It was somewhat of a shock to this firm to learn that lower prices would not bring the desired addition to volume, as such prices would be met by competitors, even though their costs might be high. The market would not absorb additional production, and additional business could only be obtained by depriving competitors of some of their trade.

When this economic truth was understood, the firm immediately adopted a policy of insisting upon pricing their products upon a basis that would earn them their full profit when producing their normal share of the offering business. This policy brought immediate profit improvement to such an extent that within two years they were offered nearly four times the book value of their business by a large national competitor.

A still greater benefit to industrial development resulted through the investment of a part of the earnings of this firm in three additional new enterprises, to each of which the same policy of profit-insistence was brought. Each of these enterprises have become very successful; each is growing rapidly out of individual earnings. One of these new enterprises is utilizing material native to the territory, thus developing a dormant natural resource. Another has already secured national distribution; is running its plant 24 hours a day to keep up with the demand for its products. The third new enterprise has been the means for the development of an epochal improvement in the marketing of southern fruit products that heretofore have gone to waste.

Had this firm continued its policy of cost reducing and price cutting it is doubtful that these other enterprises would yet have been developed. They have developed and are growing rapidly, and chiefly from their own earned surpluses. Outside capital is now eager to come in.

There was nothing phenomenal about this case I have cited. It is used simply to illustrate that applied economics will make established enterprises profitable and automatically provide capital for industrial development. There was nothing in the nature of this enterprise to make it easy to achieve the results outlined; in fact, the handicap of severe competition was much greater than ordinary. It is a splendid illustration of the possibilities of earning profits through correctly pricing products and through intelligent merchandising.

Our southern tier of states is blessed with an unusual variety of valuable natural resources that offer an exceptional opportunity for new ventures. New ventures demand new capital. New capital is simply the surplus capital

earned elsewhere and not needed at its earned source.

Encourage and assist your local enterprises to a better understanding of their obligations to earn profits; not only for the sake of stockholders but for the sake of progress. Profits must be considered as an obligation to society.

It is easier to help your established industries to profits, stability, and growth than to find ready-made industries willing to move bodily from present locations to your community. There are, of course, many cases that justify the transfer of industries from one location to another, but these are much rarer than is usually realized, and many movements have been undertaken that have proved unwise. Frequently the community desiring the new industry makes sacrifices in taxes, concessions and even donations of land or buildings that are not justified by the ultimate benefits. The firms that move for the sake of these offerings are usually not operating profitably in their established location, and the mere moving to another community will not improve its management and profit-making ability.

One very common inducement offered prospective industries, especially by southern communities, is "our abundance of cheap labor." The firm that grabs at the opportunity to get cheap labor is usually quickly disillusioned. Labor costs approximately the same for the same total of effort, regardless of wage rates. The South has a large supply of potential skilled labor and executives. Industries seeking locations where they may develop expert ability are far more desirable than those seeking cheap labor only. The profits from a community of 2,000 well-paid workers will result in more progress than will be found from 3,000 workers employed at a bare living wage.

The firm that thinks it needs to operate with underpaid labor in order to succeed is not a success and will eventually become a detriment to the community. Success today depends more upon profitable merchandising of manufactured products than upon subnormal costs. We have so developed our producing capacities per employe that we now need two persons to distribute the production of every producer.

It is this economic fact that is forcing the consideration of merchandising as of primary importance today. Manufacturers must first determine where and how to find profitable markets for their products before they can assure operating upon a profitable basis. This applies equally to established industries as to new enterprises. The manufacturer must conduct his sales effort with the object of building up permanent and profitable business. All too often his

sales effort is directed towards the purpose of building up sales by taking trade that normally belongs to others. He is too apt to do this by arbitrary and unintelligent price cutting entirely because of his lack of knowledge of the economics of profiting.

The South is ready and eager for large industrial development. It is in position to take advantage of the most modern developments in industrial science. Among the axioms that have been evolved in relation to industrial economics is that normal profits must be earned upon the normal proportion of capacity at which an industry as a whole operates. The firm or firms who aim to make a normal profit by selling at prices that compel them to secure more than their share of the available business in order to earn their normal profit simply can not succeed over a period of time.

Intelligent merchandising presupposes a knowledge of the prices that must be obtained in order to insure full profits for all concerned. When these prices are known, they can be obtained even in the face of severe competition from others in the industry. This is not always easy to accomplish, and it sometimes means a complete revision of the character of products or of the markets, but it is an accepted rule that any worthy business can be made to produce the profits that it should earn.

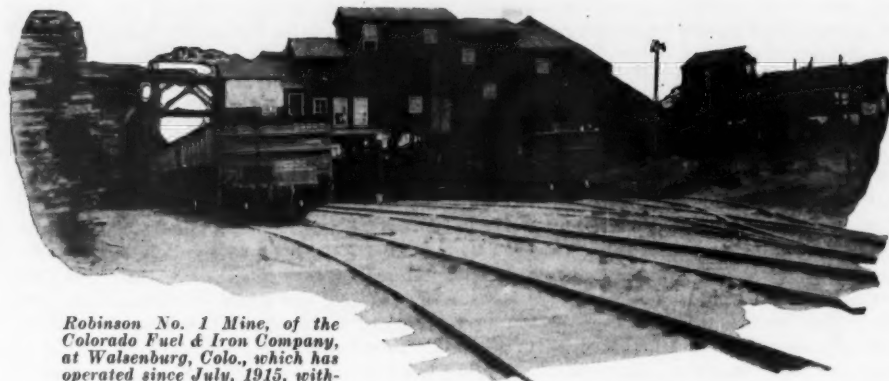
The South has many products that today are properly recognized and are bringing their producers substantial profits. There are many others, however, that offer exceptional opportunity for sound and profitable merchandising that will affect not only the manufacturers and distributors but will also bring more profitable returns to agricultural, mining, and seafaring interests affected by their production and sales.

As a simple example of what can be done by intelligent merchandising for profit I will cite the lowly oyster shell. One firm is said to be getting from 15 to 20 percent more for this material, taken from southern waters, than any of its numerous competitors, and making a substantial profit in the face of severe competition. Consistently adhering to a profit-making policy has brought this enterprise to the position of leadership it now holds in the industry.

Once manufacturers learn that there are economic principles governing profits, our industrial progress will be greatly accelerated. There is nothing difficult or mysterious in the application or understanding of these principles. Business has been groping for remedies and panaceas for business ills. When they apply sound profiting principles these ills disappear, and profits follow.

Profits is the basis of all industrial progress.

SAFETY in Coal Mining



By R. L. HAIR*

Robinson No. 1 Mine, of the Colorado Fuel & Iron Company, at Walsenburg, Colo., which has operated since July, 1915, without a fatal accident

THE Colorado Fuel and Iron Company, with which I have been connected for some years, pioneered in the safety movement, and what I shall say will be drawn largely from the safety program which this company has laid down, and which I have had the pleasure of helping to carry out.

Coal mining must, undoubtedly, be classed as a hazardous occupation. By thus placing proper value on the importance of our problem and its relationship to the successful functioning of any mine operation, we can direct our efforts and properly plan our attack on mine accidents, which exact each year from the mining industry such a costly toll. We will be successful in this work of accident prevention in direct proportion to the effort we put forth and the importance we attach to this problem.

Too often this question of increased safety for workmen is not regarded as seriously as it should be; too often management is apt to minimize the effect a high accident rate has on the production rate of an operation. While it may not be possible to prove by actual figures that successful accident prevention work increases production, we are confident, after having watched the results of this work over a period of years, that safety work has assisted in the maintenance and increasing of production.

Statistics have shown us that the job of preventing accidents does not consist solely of guarding dangerous places and eliminating unsafe practices. Careful investigation has revealed that only a small percentage of accidents occur from physical causes, and with this definite

HOW safety work has assisted the Colorado Fuel & Iron Company in maintaining and increasing production—Program started twenty years ago—One mine has gone over thirteen years without fatality—Major considerations of safety work outlined

information we have based our safety program on four major precepts:

- (1) Careful analysis of accident causes.
- (2) The establishment of a definite safety program.
- (3) The education of the worker to safer methods.
- (4) Enforcement of established safety regulations.

Our first major consideration of accident causes embraces, of course, complete investigation of accidents, tabulation by age, service, nationality, time of accident, cause, etc., and the following is a brief summary of some of the things we have learned from a study of our accidents:

(1) The principal cause of coal mine accidents, from both a frequency and severity standpoint, are those which are caused by falls of rock and coal from the roof and sides. This constitutes the greatest underground hazard, and thus generally recognized, is probably receiving more attention today than at any previous time in mining history. Injuries caused by falls might well be termed in modern football vernacular a "double threat"; they not only occur oftener but, as a rule, are more serious than any other class of injuries, often resulting fatally. If there is to be any material reduction of injuries from falls, strict attention must be given to the education of the miner in proper timbering methods, and rigid enforcement of timbering regulations.

(2) Haulage accidents are the second largest contributing factor to a high accident rate, and are caused for the greater part by carelessness or thoughtlessness on the part of the injured employee. Occasionally, of course, a trip may be wrecked or something else happen, the blame for which can not be placed on any particular employee, but these accidents can be greatly reduced by the exercise of greater caution on the part of all employees and strict observance of haulage regulations.

(3) In 1928, 26 percent of our injuries were caused by falls of rock, 13 percent by falls of coal, and 21 percent by pit cars. Injuries caused by mining machines, lifting, electricity, props, mules, etc., from the remaining 40 percent, and while each of these divisions are not high as a general average in either frequency or severity, their aggregate total makes the third major classification.

(4) We find that usually it is not the inexperienced men who get hurt, but instead it is the men who have had several years' experience.

(5) A nationality study of injuries revealed to us that the percentage of injury in each nationality group checked very closely with the employment percentage of the various groups.

(6) The installation of goggles at our mines reduced eye injuries from a total of 55 in 1924 to 16 in 1928.

(7) Three thousand five hundred of our employees have been given first-aid training since the installation of our mine-rescue cars, and 1,000 have been trained in mine-rescue work.

(8) Our 1928 accident report shows the lowest number of nonfatal injuries since 1918, and a reduction of 31 percent over the average for the past five years. Our fatality record for 1928, while still higher than we would like to see it, is

* General Superintendent, Colorado Fuel & Iron Co., Fuel Department, Pueblo, Colo.

Presented before the Regional Safety Conference of the National Safety Council, Denver, Colo., January 10, 1929.

the second lowest year in the history of the fuel department. We are thus encouraged to continue our safety work with greater effort with the knowledge that we are making definite progress.

A complete report of each accident is made to our legal department to comply with compensation law provisions, and in addition to this another report of the accident is made for the purpose of determining the cause, where the responsibility lies, and how similar accidents may be avoided. Until these facts are known there can be no successful institution of safety measures.

In the second major division of our accident-prevention work, the establishment of a clearly defined safety program, we believe the primary consideration should be the thorough understanding of that program by local mine offi-

operations. In 1910 miner's electric lamps were installed at some of the operations, and now the newer electric safety lamp, with a greater candlepower insuring greater light and increased safety. These newer electric lamps have been installed at one of the larger mines at the request of the employees, and some of them are now on trial at one of the other operations.

At this point I would like to cite an example of what can be accomplished by a definitely laid down and enforced safety program.

The Robinson No. 1 mine, one of our properties, located in the Walsenburg district, operated from July 27, 1915, to December 31, 1928, without a fatal accident, during which period 2,433,091 tons of coal were mined. The mine was awarded a certificate of honor by the

Safety committees appointed at each mine, composed of local officials and representatives of the employees. These committees keep in active touch with the men and encourage the study of safe practices.

Engineering sketches of serious and fatal accidents are posted on the mine bulletin board, and portray how an accident occurred, and how it may be avoided in future.

Safety films are secured from the U. S. Bureau of Mines and shown at frequent intervals.

A five-minute safety talk by one of the foremen is given to each employee every two weeks.

Instruction given concerning laws of state and rules of company to each new employee.

Mass meetings with officials of company and employees.

Annual trip of our first-aid car on first-aid instruction and safety education.

Special safety features, such as putting safety-first cards on pit cars, and small safety stickers on miner's

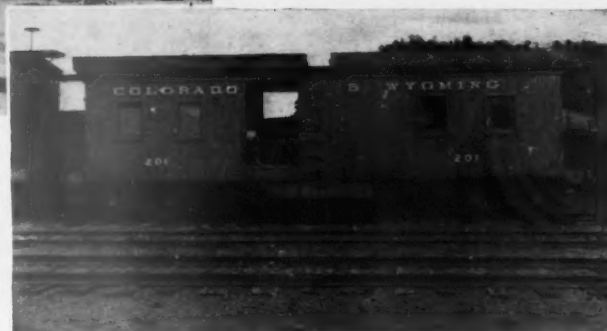


cial and employees. The development of a feeling of personal responsibility and cooperation on the part of everyone. This we have endeavored to accomplish through personal contact, safety education, general meetings of employees, and committee work; management and men thus meeting on a common ground, striving to attain a goal mutually beneficial.

The Colorado Fuel and Iron Company started its safety program as early as October, 1908, when record is found of a safety and first-aid meeting at the Fremont mine. Draeger helmets were purchased in January, 1910. Difficulty was experienced in giving the training at the mines, consequently the idea was conceived of equipping a rescue car which could be taken around from one mine to the other. This was the first mine-rescue car in the United States. In 1923 the company placed in service a Pullman-type rescue car, which is probably the best-equipped privately owned rescue car in the United States.

In 1909 the company started experimenting with a flameless powder, which was promptly adopted. Sprinkling and humidifying systems were installed in 1910, and every effort has been made throughout the years to keep in active touch with accepted standards for best mining practice. In recent years, of course, has come rock dusting, which has proven very successful at several of our

Above — Pullman-type mine-rescue car, put into service in 1923 by the Colorado Fuel & Iron Company and one of the best-equipped privately owned rescue cars in the country



Right — The first mine-rescue car in the United States, equipped and put into service by the Colorado Fuel & Iron Co. in 1910

Joseph A. Holmes Safety Association. Mr. Dave Muir, who has been mine foreman during all of the above period, is an ardent believer in safety first, and in accepting this certificate said that he attributed their success in accident prevention to careful supervision, proper discipline of careless or indifferent workmen, and personal contact with his men.

We are constantly telling our men that accidents can and must be avoided, and our assertions are based on records such as the one made at the Robinson No. 1 mine.

The third major division, or education of the workman in safer methods, has been carried on in the following manner:

Membership with the National Safety Council, and their safety literature in the form of posters, circulars, health bulletins, etc., are posted regularly on mine bulletin boards.

lamps. "I will be careful" buttons are issued from time to time, and certificates and cards are given for completed first-aid courses.

The success of any safety work varies proportionately with the interest and cooperation of the workmen themselves, and a diversified program of education is necessary in winning the larger percentage of the employees to safer practices.

The foreman plays a most important part in safety work. He is in close contact with the men and is in a better position by far to carry on educational work than any other man or group of men in the organization. The workman's attitude toward safety depends in a large measure on the attitude of the foreman; if he is indifferent, the men will be indifferent. But if he believes in safety, and shows it in what he says and does each day, it will be reflected in the attitude of the employees in using more care in the performance of their duties.

The last (Continued on page 354)

RESEARCH—An Essential Factor in INDUSTRIAL PROGRESS*

Progress in every line of industry demands perpetual inventory, as to production costs, processes and equipment, available markets, quality of product, competitive products and expansion program—Research organization equips executive to obtain knowledge of his business necessary to progress

By B. G. KLUGH *

THE survival of every business hangs upon its profits. Continued profits can be assured only through progress. Industrial progress synonymizes service. In the final analysis, the test of every progressive step lies in the degree to which the interest of the ultimate consumer is served. Cost and quality of product are the basic elements of the consumer's interest. Movements directed toward any other ends are not ultimately effective progress.

Abnormal profits in industrial business are sometimes barriers to progress, especially if directed by temporary vision. There is a tendency toward inertia when large profits prevail. Under such conditions by-products may be wasted, inefficient processes and equipment may continue in service, mediocre products sold, and the consumer's real interests disregarded, with the business in the main still showing good profits. Many notable improvements in the past history of industrial development have come about only under external pressure. We know of many instances of the utilization of by-products only developed by force of public demand for nuisance abatement. Many wasteful processes have continued until competition forced efficiency. Improvements in products in forms better suited to consumer's requirements have been effected in many cases only when competition from external sources supplied the required pressure.

Today substantially every industry is faced with this pressure. Progress in every line of industry demands a perpetual inventory of technical status of each and every business that hopes to survive. Industrialists are automatically

submitted a questionnaire, including the following:

- (1) Are your production costs at the irreducible minimum in every detail?
- (2) Are your processes and equipment becoming obsolete?
- (3) Are you reaching all available markets with your existing products?
- (4) Are your products of such quality that they bring the highest prices or largest profits?
- (5) What new products or improvements are likely to supplant yours by better serving the interests of the consumers of your present products?
- (6) What new lines of production are economically sound for your expansion program?

These six questions are outside the routine of administrative activities. They are rather general as presented and all involve more or less detail study to obtain the answer. Accurate knowledge on all those matters involved is essential to industrial progress, and its attainment requires research.

Research, as its name implies, is essentially in an unknown field. Neither the results nor the cost can be predicted with exactness. However, with intelligent planning, with a clear vision of the end in view, and under proper personnel and direction research will ultimately bring rich rewards to the industry it serves. All of these qualifications are essential to the success of any specific industrial research problem. Otherwise, the costs are a total loss and perhaps misleading. Each industry requires individual study for its research organization. The problems requiring solution by research are usually obvious. The line of attack is likewise manifest. It is then a matter of selecting personnel and defining a policy. With the right personnel,

the proper policy is automatically established. No haphazard experimental shortcuts should be tolerated. If the problems are solved by such means, it is usually an accident, and that is just what research is set up to prevent. Every problem should be approached from scientific fundamentals, and every step with exact knowledge of its causes and effects. Research proceeds logically from the known to the unknown. Its purpose is to supply exact knowledge, establish facts, develop data, and bring into being processes or products which did not exist before.

Organization of research generally requires opposite tactics to that of routine production. The army type of organization defeats the object of research before it starts. An army is a wonderful machine for destruction and possibly for routine operations. It is effective for concentrated physical actions requiring neither thought nor initiative except from supreme command. Research is essentially creative and constructive. It demands individual effort, resourcefulness, competence and judgment. If your research men are imbued with a realization of the dignity and importance of their work, provided with a clear vision of the end to be attained, given definite responsibility, with authority and means of doing it, they will bring you marvelous results. They must, above all, be freed from petty nagging, as well as arbitrary domination, interference and dictation from the strong-arm, loud-voiced type of executive without knowledge of the principles involved.

With these fundamentals of a research organization established, the industrial executive is equipped to obtain the knowledge of his business necessary to the progress which will sustain it.

* Federal Phosphorus Company, Division of the Swann Corporation.

I can best illustrate further details of research organization by reference to incidents in its application by the company I serve. In the main group forming the Swann Corporation, the operating companies—Federal Phosphorous Company, Federal Abrasives Company, Federal Carbide Company, and Southern Mangane Corporation—have a unified research organization. This institution is the result of a great amount of study, investment and experimentation. We do not yet consider its structure perfect, but we are assured of its value and permanence as an institution. The research department is separate and distinct from the production, sales, engineering or accounting departments. It consists of three well-defined divisions—the commercial research, chemical research and development. All three departments are under separate heads, but are coordinated according to the requirements of each problem being studied or worked out.

The commercial research department takes up and completes studies upon the commercial phase of any problems presented. This includes market surveys, investigations of new processes, products or proposals. Any proposed new product is first subjected to their investigation and report. In this they cover market analysis and trends in that and possible competitive products, regard being taken to statistics of various consuming centers, raw materials, freight rates, tariffs, production costs, consumption, old and new uses, present and prospective processes of manufacture, patent situation, investment costs, and especially its relation to our existing operations and business. When this report is completed, we generally know whether or not the proposal is a sound one for us to consider. If further research and development are necessary, the analysis of the commercial research department usually determines if such proposal justifies the expense. These reports are kept up to date to constantly measure them against changing conditions affecting each case.

Whenever a new product is developed from the chemical research, the commercial research department proceeds to investigate its possible markets and uses in any and all fields, depending upon its characteristics. Occasionally they find certain modifications required in such new product and send it back to the chemical research department for further work. When the costs are defined and the markets indicated, the matter automatically passes to the sales, development or production departments as necessary.

The chemical research department covers all work of a fundamental and scientific nature. Our work covers a broad field of metallurgical, organic and inorganic chemical products and proc-

esses. They usually proceed first with an exhaustive study of the literature on any subject submitted to them. With the known data and fundamental principles established, the selected specialists of the organization are assigned each specific problem to work out to a conclusion. They carry this through to a point of obtaining full data as to the process or product involved. They establish facts and data relating to all process steps, materials, yields, recoveries, temperatures, physical and chemical properties, thermal factors and all laboratory features.

The development department takes up the problem as completed by the work of the chemical research department and works it out to the plant production stage. In this they design the necessary equipment, construct the pilot plant, prove out its operation to the point where the production plant may be safely designed, built and operated. Some projects are in such state that they may go directly to the development department without intervention of the chemical research department. Wherever necessary the chemical research specialists follow the development through.

Careful coordination of all three departments on all problems is necessary to keep the research in general on a sound basis.

It will be of interest to review a few of the problems worked out in our company through research. In the early stages our very existence was at stake. Our proposed processes or products had no precedent. It was urgent that they be developed to a profitable stage. Substantially every process or product of the Swann Corporation has been developed within the organization. Such competitive products as we manufacture were mostly by secret processes or methods to which access was not available. Study indicated that their production was a sound business proposition under prevailing southern conditions. Theoretical study and calculations by our technical staff pointed the way to processes with profitable prospect. So with research and development we "went and did."

There have been no rosy paths. There were many disappointing results upon the first, second and nth attempts. The ultimate success in all cases is primarily due to the courage, vision, perseverance and patience of our president, Mr. Theodore Swann, who inspired confidence with his faith in the outcome and the personnel and saw each project through to a definite and effective conclusion.

Our principal business to date has been phosphoric acid and its derivatives. The Federal electric phosphate smelting process, with direct production of concentrated and substantially pure phosphoric acid, is the only working process of its

kind in the world. It was developed entirely at Anniston, Ala., by the present organization. Other attempts to produce phosphoric acid by this general procedure had been tried, but they all failed either to produce at all or to make a production cost within the selling price.

Our process has been adopted in Europe. Our organization supplied the complete design and technical instruction for a 20,000-kilowatt plant in France. This plant will be in operation in about a month. The product will practically all go into concentrated soluble fertilizers. We have confined our production largely to food and chemical grades, but are at present conducting research and investigations directed toward fertilizer products on a larger scale.

All our derivatives and salts of phosphoric acid required careful research and development. The prior art of similar phosphate chemicals started with dilute acids, so completely new process development was necessary to take advantage of costs and purity provided in the new type of phosphoric acid our primary process had developed.

While describing results on phosphate products, which research has done for us, one of our more recent developments is of interest. This is a garden fertilizer of the highest concentration and solubility ever attained. It is manufactured partly in our Anniston Works and partly in our St. Louis Works. It is substantially 100 percent water soluble, analyzes 17 percent nitrogen, 33 percent P₂O₅ and 17 percent K₂O, making 67 percent plant food. It contains no sulphates, chlorides nor other ballast. Other than the plant food constituents of 67 percent, the other 33 percent consists of oxygen and hydrogen essential for its chemical stability.

After developing this new compound to approach an ideal fertilizer with the ratio of plant-food constituents recommended by the Department of Agriculture, we determined to provide means for its application that would be most effective to the plants and prevent injury to them through excessive application of the concentrated material.

After several months of study by our research and development departments, there was evolved a spraying device in which the salt is placed and the apparatus hooked onto a hose line. This device causes the water in passing to dissolve into uniform and safe dilution all of the fertilizer salt in ordinary process of watering the plants. This product and apparatus is marketed by a new subsidiary of the Swann Corporation known as the Jax Plant Food Company. The product bears the trade name "Jax" and the apparatus the name "Jaxometer."

While aluminous and silicon carbide abrasives were well-established products, it was necessary for our research depart-

ment to completely develop the process of manufacture. The two classes of abrasives are distinct products and require distinctly different types of electric furnaces and operation. Careful chemical control is necessary in production of the crude blocks of both products. After working out the furnacing operation, we found that we were only half through with the problem. The grinding, treating, and screening is a most delicate procedure in order to obtain a product for the consumer's requirements. There are 22 sizes required, and each of a closer sizing specification than probably any material in industry.

We had to develop a special mill that would crush the grain down to particles of substantially cubical form, since the flat or slivery grain is very objectionable for grinding wheel and polishing operations. This was really mechanical research, but was finally accomplished. An unusual feature is that the grinding surfaces must be changed every 30 minutes of operation. The capacity of this mill makes up for the deficiency in lasting qualities.

In trying to determine specifications for the sizing of abrasive grain we were unable to check any results on the grain on the market. We found that there were no testing screens on the market of sufficiently consistent accuracy to give acceptable check results. So we set about in the research department to develop standard testing screens that would fulfill the standards we set up. It required nine months of intensive work, but we now have this problem so competently solved that it has raised the standards of abrasive grain industry.

These are but a few of the details of abrasive grain that have been worked out through our research efforts. Another one of more than passing interest is the production of an entirely new characteristic grain known now in the trade as "Federal S. P." We have now become a factor in the abrasive industry and hold an enviable place in it.

Our only hope of getting into these markets, in which the freight rates were against us, lay in producing an actually superior product. There were no reciprocal trade relations or other artificial sales advantages for us. The consumers were somewhat indefinite in their specifications, so it was necessary through our research department to study and ascertain just what characteristics and degree thereof constituted their best interests. This is one of the many examples of the beneficial results of applying the work of manufacturer's research department to the consumer's interests.

Incidentally, our company stands on the principle that we make and sell only quality products. One of the great mistakes in southern industrial development

seems to have been in marketing their products in crude or mediocre quality state, so that the first stage in which a market is found is taken. There is no reason why products of higher quality can not be manufactured in the South, and it is fundamentally on a sounder basis when superior quality of product is made. In our case it is essential, since we have freight disadvantages, inasmuch as the greater part is sold in the North in proximity to northern producers. By standing firmly on this policy we have developed a preferential market and, in many cases, a premium on our products.

Another interesting series of products has been put on a manufacturing basis in our works during the past year. This development comes entirely from our research and is a new product not elsewhere produced commercially in the world. The products are diphenyl, an organic compound, and many derivatives thereof.

As a matter of history of this new product, one of the large oil refiners developed a new distillation process requiring accurate temperature control by indirect heat at temperatures around 700 degrees Centigrade. They decided that diphenyl would fill the requirements and approached us to produce it. Diphenyl at that time, November, 1927, ranked as a rare chemical or laboratory curiosity. We succeeded in buying 1 pound, for which we paid \$40. Our research department launched an intensive program, with the result that in about four months time the laboratory work was completed, the plant designed and built, and 100,000 pounds delivered at about a price of 40 cents per pound; 1/100 the price four months back.

Diphenyl was produced by us primarily for its physical properties as a heat-transfer medium. It melts at 71° C., boils at 254° C., and is a stable neutral gas at very high temperatures. Physical property tables are being prepared covering vapor pressure, entropy, and all factors of interest in heat transfer. In this field this product bids fair to play an important role in the fields of high-temperature distillations, digestions, evaporations, drying, and especially in steam power installations where the reheating between stages has been a troublesome problem.

Having put this new organic basic compound upon an economical manufacturing basis, naturally the derivatives become of interest. Our research department has at present a group of highly trained organic chemists intensively at work on these derivatives. During the past few months a number of most interesting and promising new products have been developed. These include the chloro, nitro, and amino derivatives. Being entirely new products,

it is necessary, first, to make and isolate them, then investigate their fields of usefulness.

One derivative, ortho-chlorodiphenyl, has a most unusual combination of properties. It is a limped, colorless liquid boiling at about 400° F. It is a powerful solvent and cleaning agent, and appears to have dielectric and insulating properties superior to any transformer or circuit-breaker oil.

Another derivative of equal interest is polychlorodiphenyl. This is a solid resin melting at around 150° C. It has unusual flame retarding and insulating properties. It is so promising that we have organized a special division to develop the flame-retarding features by application to lumber, building materials, textiles, and all cases requiring flame-proofing.

The nitro and amino derivatives are applicable in the dyestuff industry.

There are upward of 50 new products already projected which apply in a great number of industries. It is not possible to even enumerate the compounds lined up from diphenyl, as they are so extensive, and the uses are even greater.

The point in this discourse is that it could only have come about through research.

I could continue with probably 100 instances of benefits our companies have derived from research. In many cases their negative results have kept us out of making investments that, on the surface, appeared profitable, but the exact knowledge derived from research put them up in true light for rejection in time.

A recent five months study of certain industries in Europe, and especially in Germany and Belgium, convinced me of the necessity of every American industrialist getting his house in order to meet the competition in many products they are preparing to export. I would like to have time to relate instances of their outstanding research program, but such is impossible here.

Southern industrial developments essentially involve new problems. Raw materials, processes, equipment, and marketing have new phases constantly being presented. They have a great advance in lack of being handicapped with tradition or obsolescence. The wonderful new field is open. Great care is necessary to start right and keep any new industry on a sound and economic basis while seizing advantages present progress presents. The gap between pure science and applied science is rapidly narrowing. The abstruse theories of today are the precise industrial tools of tomorrow. Progress comes through availing ourselves of the opportunities science offers. The means is through research, the essential factor of industrial progress.

A MINING SCHOOL in the CORN BELT

A DISCUSSION of the history, curricula, equipment and ideals of the Department of Mining Engineering, University of Illinois

By A. C. CALLEN *



SOME of my friends in Pennsylvania and West Virginia as well as some in the West are curious at times as to the why and wherefore of a mining school in the corn belt. Their attitude is not to be wondered at for if the idea of mountains and canyons, hills and valleys, is commonly associated with mining, then surely Illinois might easily be relegated to the background when mineral industries are discussed.

But the claims of Illinois to a place in the mining world are not based on topography but upon mineral output. Here it was in 1673 that the first discovery of coal in the United States by Europeans was made—made by men whose names have ever since had a special significance and after whom towns have been named, Joliet and Marquette. Standing seventh in the list of the states in value of mineral product—

fourth if petroleum were not included in the determination—Illinois has an unquestioned place as one of the leading mineral-producing states of the Nation.

With a list of mineral products ranging from barite to zinc, with coal reserves of about 200 billion tons, with the largest coal mines in the world, with the great metallurgical plants in the Chicago area, with more mine employees than are employed in all the underground metal mines of the United States, with a mineral production equalling the combined value of that from Arizona, Colorado, Nevada and New Mexico—with these things and more can anyone seriously ask the question: "Why have a mining school in the corn belt?"

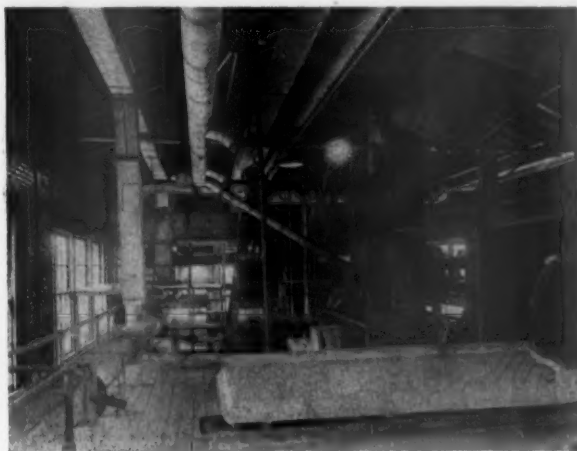
The history of mining instruction at Illinois goes back to the late '80's and early '90's. Dr. J. J. Rutledge, chief mine engineer of the Maryland Bureau of Mines, and the late James B. Needham were graduates about the end of

that first period. For about 15 years no mining instruction was offered, in spite of the growing importance of Illinois in the mineral industry.

On March 11, 12 and 13, 1909, the Illinois Fuel Conference was held at the university in connection with the formal opening of the Urbana "Laboratory for Mine Accident and Mine Rescue Work," a rescue station established by joint action of the Technologic Branch of the United States Geological Survey (which later became the Bureau of Mines), the State Geological Survey and the University of Illinois. At this meeting a committee of nine was appointed—three mine inspectors, three representatives from the Illinois Coal Operators' Association and three members of the United Mine Workers. The committee was to work toward the goal of the establishing of a department of mining engineering in the University of Illinois.

The committee certainly functioned, for 19 days later a bill was introduced

* Professor of mining engineering and head of the department. Fifth of a series of 12 articles on mining schools of distinction.



Left—Experimental ventilation ducts. Besides the duct system this illustration shows the Butchart table (ready for a new deck), the top of the stamp mill, overhead bins,



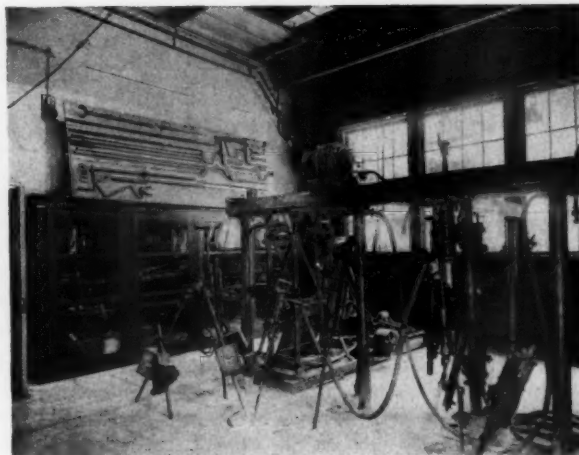
and control panel for Hummer screen. At right—A corner of the fire assay laboratory. These are all high-pressure gas-fired furnaces

into the general assembly to the effect "that the trustees of the University of Illinois be authorized and directed to establish, in the College of Engineering, at the university, a department of mining engineering." The bill passed, was approved on June 8 and was in force on July 1, 1909.

While the fuel conference was interested primarily in fuel, yet the bill presented to the legislature was not narrow for it provided not only for instruction but also directed the department to "concern itself with the development and dissemination of such scientific facts as are likely to be of service in improving the practice of mining, with reference to efficiency in operation, to the security of life in the mines and to the conservation of the fuel and other mineral resources of the state." Thus from the beginning, the ideal of the department has been fixed by those who were instrumental in establishing it—*efficient training and scientific research.*

Prof. Harry Harkness Stoek, then editor of *Mines and Minerals*, was called to head the department. His vision, enthusiasm and technical ability were responsible for the development of the curriculum, the construction and equipment of a fine mining laboratory, the securing of a competent teaching staff and the maintenance of the highest standards of technical instruction. His objective always was for the University of Illinois to be the equal of any mining school in the country and superior to all in the coal mining. For 14 years, until his death on March 1, 1923, he devoted his talents to the attainment of this ideal. A bronze tablet by Lorado Taft has been placed in the engineering library by his former students, colleagues and friends to remind coming generations of students of the contri-

Drilling Equipment. Augers—breast, post and electric; air drills—hammer and piston—unmounted, column, and tripod mountings; portable diamond drill



butions Dr. Stoek made to mining education.

Entrance to the College of Engineering of the University of Illinois requires 15 units of high-school work, of which 6 units must be satisfied by offering 3 units of English and 3 units of mathematics—algebra, advanced algebra, plane and solid geometry. The curriculum in mining engineering endeavors to emphasize fundamentals and to ignore frills. For the first year the curriculum is the same as most of the other engineering courses, and in the sophomore year is almost the same as the others except that mine surveying is studied throughout the entire year. During these two years a strong foundation is laid upon which to build the specialized technical training—English, chemistry, mathematics, physics, and drawing, plus surveying and a first course in mechanics.

In the junior year the student continues his training in theoretical and applied mechanics, and has also quantitative analysis, crystallography and min-

eralogy, geology, and courses in mechanical and electrical engineering. This year also sees the beginning of the specialized mining courses, the first semester covering explosives and blasting, rock drilling, coal cutting, shaft sinking and tunneling, and loading machines. The second semester course is devoted exclusively to a study of mining methods.

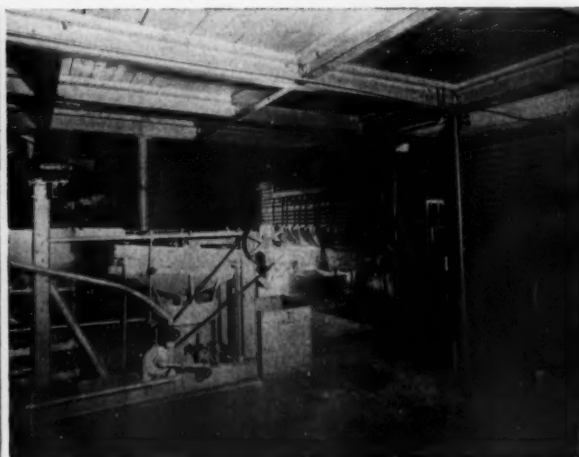
In the senior year there is an opportunity for specialization, three options being offered—coal mining, metal mining, and metallurgy. The following subjects are common to the three options, although special problems are assigned depending on the option selected:

- Metallurgy (general and ferrous).
- Mine administration.
- Ore dressing and coal preparation.
- Mining and metallurgical design.
- Mining reports.
- Senior inspection trip.

In addition to these, the coal miners take mine ventilation; mine ventilation laboratory; hoisting, haulage, and pump-



Coal rolls and Arms air table. The gyratory crusher is just behind the coal rolls. At the left is the coal pulverizer, beyond it the ore rolls



The Chance sand flotation unit. To the right are the Kelly filter, briquetting press, Adkins classifier and Marcy rod mill



Concentration sections. In the picture to the left are shown pneumatic and mechanical flotation cells, small jigs, Oliver continuous filter, 3-spigot classifier, cone classifier, and overhead bins. The Peck carrier which



serves the entire laboratory is shown at the left. In the right-hand illustration are shown the Pachuca tank, small jig, Denver 3-cell sub-A flotation unit, and concentrating tables

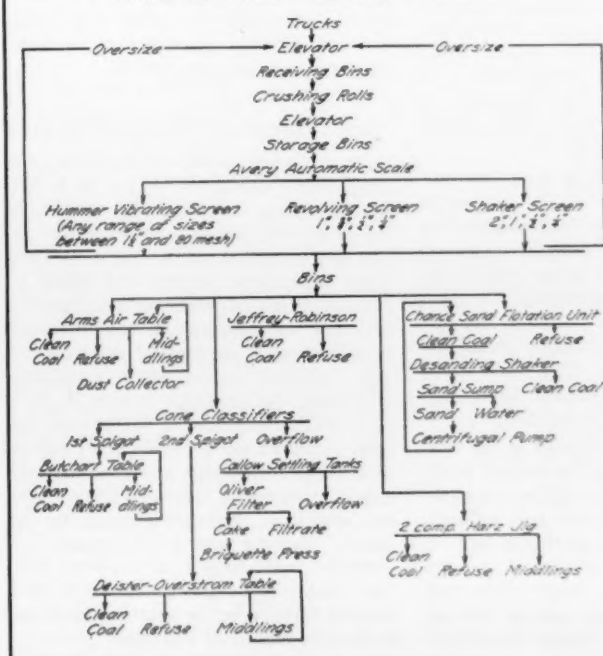
ing; mine examination and valuation; and fuels. The metal miners take mine ventilation; fire assaying; hoisting, haulage, and pumping; mine examination and valuation; and economic geology. The metallurgists take fire assaying; fuels; nonferrous metallurgy, metallurgical calculations, and metallurgical laboratory.

In classroom, drawing room, and laboratory principles are stressed, while minor details of practice are left for the practical employment the student is urged to secure during his summer vacations. The feeling of the staff is that

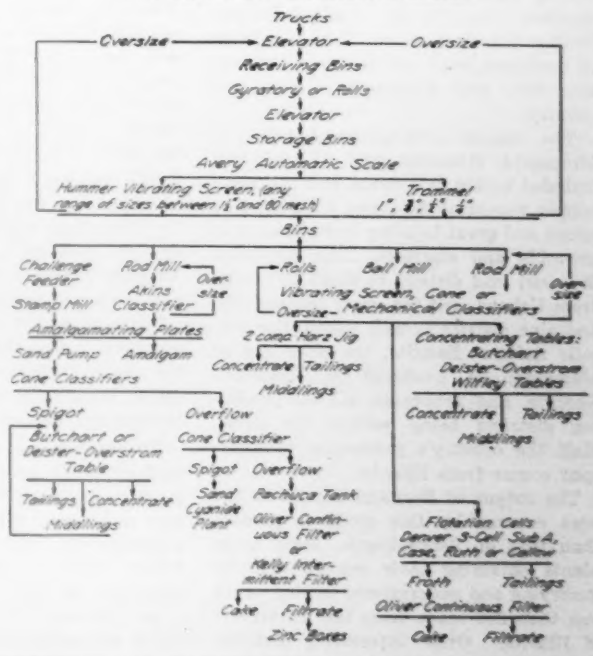
a student can acquire more real knowledge of mining practice by actual employment in an operating mine than he could ever get in a "model mine" on the university campus. But even more important—in regular employment he learns human nature, how the other fellow thinks, the value of a day's work and a day's pay; such things are not obtainable in college halls. This leaves more time to devote to fundamentally important principles that are not procurable on the outside, resulting in a more efficient utilization of the student's time.

Let it not be assumed that practice is ignored. Far from it! Every effort is made to tie up principles with practice, but the details must be left for actual mining work. Everyone will agree that a week's mucking in a mine will teach a boy more about mining practice than a year's mucking (once a week) in a drift on the campus. You will never train a timberman in a college mine, for he will absorb more real timbering practice in a month with an experienced timberman than in a lifetime in a campus mine.

General Flow Sheet - Coal Preparation Laboratory
MINING DEPARTMENT - UNIVERSITY OF ILLINOIS



General Flow Sheet - Ore Dressing Laboratory
MINING DEPARTMENT - UNIVERSITY OF ILLINOIS



Nor will inspection trips take the place of practical work. We believe in inspection trips and lay stress on them—but they serve rather to give the boy a broad perspective of the industry and an idea of its magnitude than to teach him the details of mining practice. For example, our regular senior inspection trip generally includes: Coal mining, both strip pits and underground mines; iron mining and milling, lead mining and milling, zinc smelting, lead smelting, iron blast furnaces and steel plants, and by-product coke ovens. The trip lasts a week and costs about \$50. It is worth all it costs, both in time and money, but the men return from the trip not with much knowledge of mining practice, but with an enthusiasm for their chosen life work engendered by a personal contact with the broad scope of the mineral industries.

That there are advantages in having a mining school located in the heart of a great mining district we will not deny. That there are disadvantages is obvious. But when everything has been said pro and con, we feel that the inevitable conclusion will be that no school is more ideally located than the mining engineering department at the University of Illinois. This is one of the great universities of the world, and its recognized standing gives ample assurance of instruction and equipment of the highest quality.

Situated not far from the center of population of the United States, this mining school is likewise at the center of a circle having a radius of only 500 miles, that includes the mining districts of 10 of the 12 most important mineral-producing states in the country. The exceptions are Texas and California. Within this circle is produced nearly all of the bituminous coal, iron ore, lead and zinc ore, and aluminum ore of the country.

The famous iron-mining districts of Minnesota, Michigan, and Alabama are included within this circle, and the noted copper region of Michigan with its deep mines and great hoisting engines, as well as mills and smelters. The southeast Missouri lead district is about 200 miles from Urbana, and the great tristate lead and zinc district is well within the 500-mile radius. Bauxite, the chief ore of aluminum, is produced in Arkansas, Georgia, and Tennessee, all the producing districts being within the circle. Half the country's production of fluor-spar comes from Illinois.

The output of Portland cement in the area covered by this circle is greater than that of Pennsylvania, some large plants obtaining their cement rock by quarrying and underground mining being less than 200 miles from the University of Illinois. Other interesting districts

within the circle are the zinc and the copper areas of Tennessee, the Illinois-Wisconsin lead and zinc belt, the building stone operations in Indiana, the clay producing sections of Illinois, Indiana, and Ohio, the oil and gas fields of Oklahoma, Kansas, Illinois, Indiana, Ohio, Pennsylvania, and West Virginia, as well as important metallurgical centers such as Chicago, Gary, St. Louis, Birmingham, Pittsburgh, etc.

As a center of the coal mining industry, the University of Illinois is no less important. The largest coal mines in the world are within a five hour's ride of the school. Less than 100 miles away are the famous longwall mines of northern Illinois. Kansas and Illinois have monster open-pit mines where coal is worked by stripping. The eastern bituminous coal fields of Pennsylvania and West Virginia are all within the circle, and if the radius were made a little longer the Pennsylvania anthracite region would be included.

A similar extension would include the gold and silver districts of Ontario, while the world-famous nickel deposits of the Sudbury, Ontario, district are just reached by the 500-mile radius.

With such unique facilities for inspection trips and for summer employment, it is easy to secure a broad viewpoint on the part of the student and to assist him in obtaining summer work or a job on graduation in a branch of the industry that he likes and within a night's ride of his home.

The plant and equipment of the mining engineering department are not only adequate but up to date. A splendid drawing room with a large collection of drawings, blue prints, and photographs is available for design work. A museum and hall display cases, house mine models, and a variety of apparatus and educational exhibits. A collection of nearly 4,000 lantern slides is available for classroom instruction.

The mining laboratory is a separate building and provides ample equipment for first-class work in coal preparation and ore dressing. A complete chemical laboratory and a fire assay laboratory are housed in rooms adjoining the main laboratory, as are also the sampling and grinding room, the machine shop, and the electric substation. The mine ventilation laboratory and safety lamp laboratory are also in this building.

To describe the equipment in the laboratory would be to name almost every machine one could think of, from a gyratory or a stamp mill to a Marcy rod mill, a variety of flotation machines and an Oliver continuous filter. Or if you are interested in coal, we might start with a pair of coal rolls and end up with an Arms air table or a Chance sand-flota-

tion cone. Complete auxiliary and control equipment is, of course, at hand.

The ventilation laboratory includes fans, test ducts, flexible tubing, safety lamps, explosibility-of-dust apparatus, a rock-dust testing kit, gas analysis apparatus, and so on.

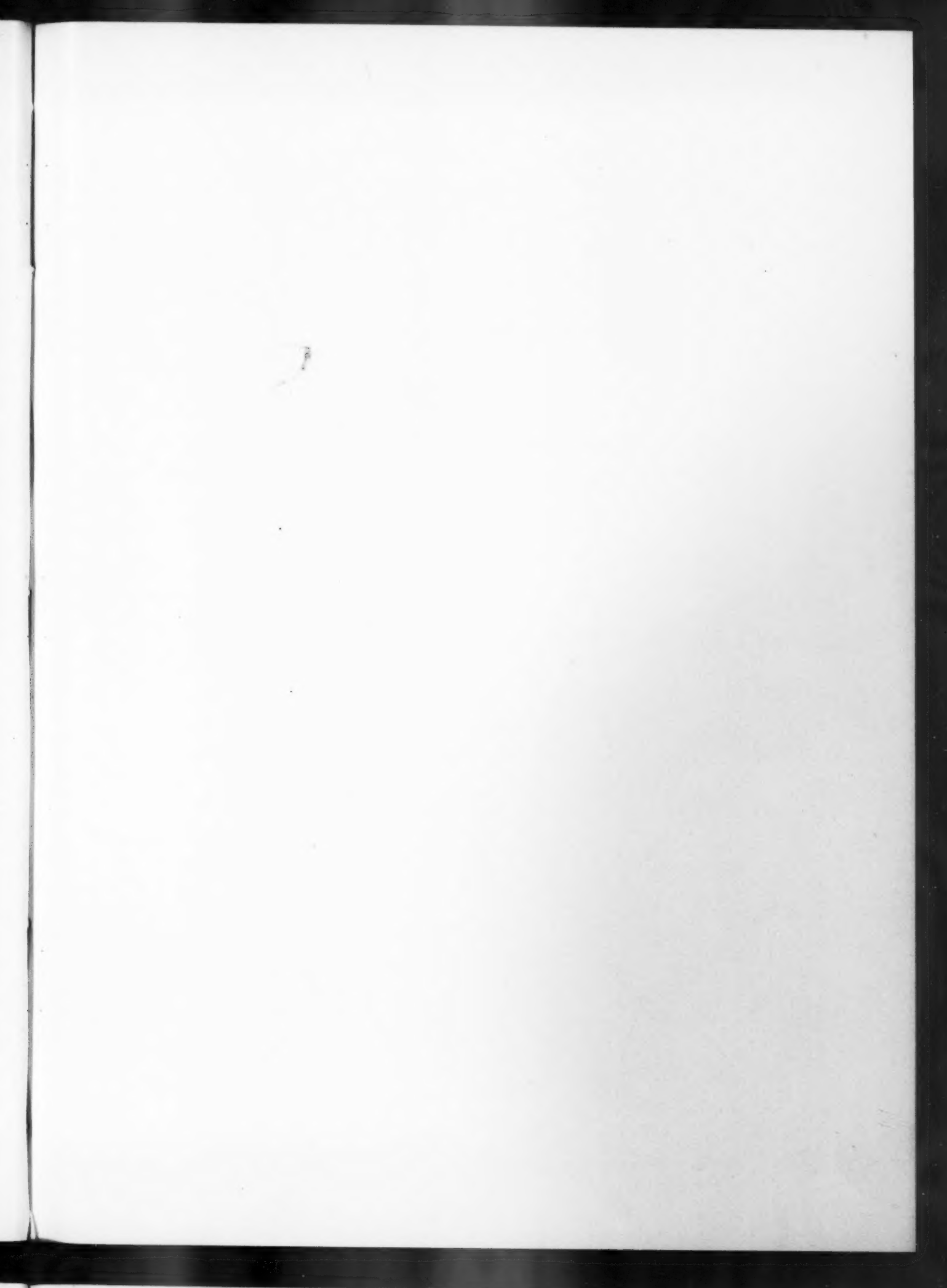
One of the most important phases of the work of the department is research. For 20 years there has been a cooperative agreement between the Mining Engineering Department and the State Geological Survey. The United States Bureau of Mines was once a party to this agreement. More than 65 bulletins and technical papers dealing with the geology, mining and utilization of coal have resulted. As a leader in mining research work, the University of Illinois has been accorded world-wide recognition.

For graduate work in mining engineering students have come from several states and from China, Japan, India and South Africa. Last June a brilliant Chinese student received his degree of Doctor of Philosophy from Illinois, his major subject being coal mining engineering.

We at Illinois believe that we are training men who will be outstanding mining engineers and mining executives in the years to come. We believe in thorough instruction, in modern laboratory equipment and methods, and in individual attention to every student. We urge each man to spend every summer vacation in mining work so that he may be better prepared to enter the industry on graduation. We are proud of our staff, our equipment, and of our students, for we are proud of the mining industry—the service industry of an industrial world—and we believe this industry demands and is entitled to the best-prepared men we can give it.

NEW TYPE OF ROCK-DUST BARRIER

As a feature of the educational campaign being conducted by the U. S. Bureau of Mines to further the rock dusting of all coal mines other than anthracite as a means of preventing or limiting mine explosions, studies are made of various types of rock-dusting barriers, intended to supplement the thorough rock dusting of all parts of the mine. A new rock-dust barrier, of the concentration type, designed by George S. Rice, chief mining engineer of the bureau, has been tested at the bureau's experimental mine, near Pittsburgh, and has very successfully passed a number of tests with the explosions of varying intensity and speed. Testing will be continued, but sufficient tests have been made to indicate that this barrier promises to be a decided success and a practical improvement over others of this type.





© Harold Gray

Sunlight and Shadows in Rock Creek Park

The SOUTH and INDUSTRIAL PROGRESS*

The tariff as a real issue in southern mineral development—Greatest service South can give world is to maintain high rate of wages and high standard of living—Mineral development of Southern Empire essential to prosperity of agriculture

By RICHARD H. EDMONDS †

A GREAT economic revolution is under way throughout the South. For the first time since the Civil War, this section can stand shoulder to shoulder in the advocacy of a protective tariff with other sections of the country. The adherence of the free-trade doctrines of the Democratic party, which since the Civil War until the last election completely dominated the South, made it almost impossible for a majority of the people to see the tariff in its true light. They regarded it largely as a scheme of eastern and western manufacturers to enrich themselves at the expense of the consumers. Southern politicians worshipping at the shrine of free trade unceasingly proclaimed the evils of a protective duty, many of them even went so far as to refuse to vote in favor of a duty on southern products, though they knew that a protective tariff on the products of other sections would be adopted. The South was thus stabbed in the back in the house of its supposed friends. Indeed, these free-trade politicians placed in the hands of northern and western manufacturers a club with which to beat down the progress of the South, for though they knew that the manufacturers would be granted a protective duty, they permitted these very manufacturers to put on the free list hundreds of things which the South has and which it could produce to its own profit and the profit of the country at large, if granted a fair degree of protection. In this way the mineral development of the South was largely halted. Manufacturers who might have been glad of the opportunity to establish plants in the South for the utilization of southern minerals did not want to go into a country where they were bitterly denounced by the newspapers and the politicians, if they favored a tariff.

Southern agriculture was made to suffer as well as the mineral interests. Importations of many things which the

South could produce to advantage kept the price of similar products in the South at so low a figure that there was no profit in them, and, in many cases, interests promising at the start were destroyed by reason of these heavy foreign importations from the Orient and from Europe. India, where the rate of wages in iron and steel works is from 8 to 10 cents a day, even including the skilled labor, ships its iron into this country and places it at points along the Atlantic coast at a cost in many cases less than the actual cost of production of iron in the United States.

Cement comes into this country, and especially in the South, at a rate which retards the development of the southern cement industry. Some of it comes almost as ballast in vessels seeking an outward cargo from the United States. It is not so much the quantity that is brought in as the fact that in holding down the employment of labor in American cement plants it reduces their profits, lessens the progress of cement making, and lessens the consumptive requirements of foodstuffs and other goods by American labor displaced from the cement industry by the products of the low wages of Europe.

An illustration of how this works is a recent case at Tampa, Fla. There is a great cement plant there which makes such a high grade of cement that it is largely bought by the Panama Canal Commission, yet when the Western Union Telegraph Company let a contract for an office building in Tampa, northern contractors, who themselves have several million dollars invested in their enterprise in Tampa, bought Belgian cement in place of Tampa cement, though I have been advised that the difference in price was at the most not over a few hundred dollars. These contractors thus minimized the prosperity of the Tampa plant, minimized the value of their own investments in Tampa, and lessened the employment of American workmen.

I was recently asked if a tariff should be placed on cement and Belgium thus

cut off in part from our market, would it not result in Belgium buying a smaller amount of American goods of one kind or another. My reply to this was that instead of buying foreign goods, it is better to create a market for American workmen at American wages, whose purchases of American goods would in the aggregate far exceed the purchases of Belgium of American products.

International interests which have been fighting against a broad protective policy for the whole country have advanced the argument that unless we buy freely from foreign countries they can not buy from us, and that, moreover, unless this trade is developed by our buying more and more from them, they will not be able to pay their indebtedness to America. If every dollar of European indebtedness to the United States were wiped out, the loss to this country over a series of years would be very much less than the loss which comes to our people from lack of employment by reason of the importations of foreign goods, cutting down the employment of American labor and reducing the ability of American workmen to consume the agricultural products of the country. I venture to say that if all the idle laborers in America were employed and the farmers were having a fair degree of prosperity, there would be a home demand sufficient to take care of the output of every industry and every farm in the United States.

Until the people of other countries learn that cheap labor will not, and can not, produce general prosperity, and until they advance their rate of wages to some extent coequal with ours, there can be no world-wide prosperity. The greatest service that we can render to the rest of the world is to maintain our high rate of wages and our high standard of living, and in this way set an example by our abundant prosperity brought about by these conditions to stimulate the rest of the world to seek higher wages to bring about their own prosperity, and thus universal prosperity.

* From a letter addressed to the Southern Industrial Development Conference of the American Mining Congress, held at Atlanta, Ga., April 11 and 12.

† Editor, Manufacturers Record.

In buying from Europe or the Orient their cheaply made goods, we are putting a premium on cheap labor and clubbing down to the extent of these importations the employment of American labor at American wages, and helping to hold wages of Europe and the Orient to their present low standard.

Now that the South has enlisted so largely upon the campaign for a protective tariff, it must stand on the platform that there shall be protection for *all* or protection for *none*. It must insist that the manufacturer who seeks protection on his product must be willing to grant a protective duty on the so-called raw materials which he uses in his plant. There are resources in America in oil and in minerals sufficient to build well-rounded industrial life which will bring prosperity to the farm, to the factory, and to the store without depending upon foreign supplies.

The theory of protection as a national duty has been seriously misunderstood because of the action of many manufacturers in demanding a duty on their products but clamoring for free trade on their raw material. They have thus created a belief among millions of people that the tariff is a selfish scheme for the enrichment of a few at the expense of the many. Sometimes I do not wonder that sensational yellow journals and rank free-trade papers have cartooned manufacturers as putting their feet as well as their snouts into the trough seeking to get all there is of food for their own prosperity without regard to the prosperity of others. That policy must be changed. It is within the power of the South to bring about that change and thus to create a nation-wide realization of the fact that rightly directed and controlled, a protective tariff is for the good of *all*, for the enrichment of every class, from the farmer and the owner or miner of the minerals, on through to the finer finished product of every variety of manufactured goods. I trust, therefore, that the South will take the lead in studying the tariff from this point of view and will stress it so vigorously that all who now believe in a protective tariff for their own products will help to blot out every thought that the tariff is a selfish scheme and join in the work for a well-rounded tariff which protects *all* interests. On that basis, the South can work, not only for its own welfare, but for the welfare and prosperity of the entire country.

Industrial and mineral developments in the South are absolutely essential to the prosperity of southern agriculture. Until, through industrial labor, there is a home demand for the products of the farm, however diversified they may be, and an opportunity for employment at home of the young men and women who

now by the thousands, finding no employment in their own section, and must go elsewhere to look for the opportunity of success, the South can never attain its full measure of prosperity.

No other region on the face of the earth is comparable to the South in natural resources so located as to be susceptible of development. Its people have inherited a strength of character, of initiative, of knowledge, of industrial thought which in cooperation with those who come from other sections can bring to the South a prosperity more general for all classes and all parts of the South than any other part of this or any other country has known. It is within the power of the southern people to accomplish this. Opportunity spells responsibility. Let our people of the South face this responsibility and do the work which will bring prosperity to the farm, which will create avenues of employment for the young men and women, and open wide the gates of opportunity. Then every willing worker, stimulated by the prospect of profitable employment, will put forth his greatest energy. Here is a field in which the South can lead the Nation to the good of all.

I have faith to believe that the South will accept this responsibility and utilize it to the blessing of the whole country in the rounding out of a protective tariff which will safeguard this, the greatest consuming market on the face of the earth, a market which can be indefinitely expanded with the increase of profitable employment through such a well-rounded tariff.

SAFETY in COAL MINING

(From page 345)

|| a major consideration in our safety work is the enforcement of rules and regulations. Industrial mining organizations throughout the United States are going into this matter of reduction of injuries with the determination that injuries can and must be reduced. Safety practice policies and accident prevention have passed the stage of being welfare issues and are becoming compulsory requirements in industry.

A large part of the safety work of numerous mine organizations in the past has been educational; now these same organizations, believing that their program of safety education has been thorough, and that their policies of safe practices have been well established, are insisting, and rightly so, that safety become a compulsory requirement of each individual operation, and the following two steps are regarded as all important:

First—The proper education of workers and bosses in accident-prevention work.

Second—Insisting that both bosses and

workers maintain a strict safety program, on the basis that there can be no excuse for the majority of industrial accidents.

There can be no successful undertaking of safety work except by dominant positive purpose. If we are negative in our idea of safety, and admit to ourselves and our workmen that accidents have occurred and can occur again, we can hope for no great measure of success. A positive stand that accidents can be prevented; that they should form no part of a properly managed operation, will bring results.

ANNUAL MEETING of COAL OPERAT- ING MEN

(From page 340)

|| men charged with the actual production of coal; third, they offer a wonderful "machinery mart" where purchasing agents and those who buy may in a short period of time inspect, under one roof, the latest equipment designed to meet production problems—an opportunity which has eliminated the old-time method which cost precious time and valuable dollars. And last, but not least, they offer five days of opportunity to mingle with fellow operators, to learn first hand what Bill or Jim or Charlie is doing; to learn what Wyoming may contribute to West Virginia's problems, and vice versa, for every coal-producing district.

These meetings are big "get-together" events. They offer the most for the least effort of anything presented to the coal operator. They are held at Cincinnati, Ohio, geographically located so that the operating man may attend the meetings with the minimum of inconvenience. The door is wide open to everyone who produces coal. Everyone is invited to this party, and everyone who comes is promised a most worth-while five days.

Once again—the place is Music Hall, Cincinnati, and the date is May 13-14-15-16-17—five days of major opportunity. Make the most of it.

ILLINOIS COAL COMPANY MAKES CREDITABLE SAFETY RECORD

The O'Gara Coal Company, operating 9 mines with an average of 2,300 employees in the southern Illinois district, produced 1,340,000 tons of coal during 1928 without incurring a single fatal accident. This exceptionally good record has been credited by A. D. Lewis, Director of the Illinois Department of Mines, largely to the 100 percent cooperative first-aid campaign carried into effect in the mines of this company in 1927, the training of the company's key men being done by the United States Bureau of Mines—these key men in turn training the remainder of the company's employees.

LEGISLATIVE Review

Extra session of 71st Congress which convened April 15 calls for limited tariff revision, agricultural relief, reapportionment of House and authorizing a census of mines, etc.—Many other proposals embodied in bills introduced to await regular session in December

RESPONDING to the call of the President, Congress convened in extra session on Monday, April 15, to enact tariff, agricultural, census and reapportionment legislation. With the exception of short recesses of a day or two which either the House or Senate may take when there is a lull in the legislative schedule, Congress is expected to meet in daily session, until early summer before the Presidential program is carried out.

The Congress is a new one, many of its members in both bodies are new and some of the questions before it are new and the country may expect new legislation. While the tariff is a continuously agitated question, it has been seven years since the last revision legislation resulted in the tariff act of 1922, which is now the present law on the question. The agricultural question is an old one having been debated in previous Congresses and passed in one form or another but failed to secure Presidential approval.

The House got down to business very promptly during the first week of the session by taking up agricultural legislation, to be followed by the tariff bill. To prevent other legislation from being considered, the House appointed only those committees which handle legislation as recommended by the President. In the Senate, however, all of the Committees were appointed as it is a continuing body, only a third of its membership being chosen every two years. But the leaders there plan to confine the activities to the subjects covered by the President's recommendations.

Notwithstanding these restrictions on the work of the session, Representatives and Senators are introducing several hundred bills on a variety of legislation proposals. Many of these bills have been previously introduced but on which no action has been taken. These measures will lie dormant until the December session.

Discussion of mining featured the debate on the agricultural relief bill, the purpose of which, according to its pro-

ponents, is to place the farming interests on an economic equality with mining.

"Industry has become almost completely mechanized and the cost of labor therefore is a lesser proportion of its gross volume of sales," says the report by Representative Haugen (Rep., Iowa). "In many cases, copper and oil for example, it has bought or created a complete chain of operations from the production of the raw material to the manufacture, advertising, and direct sale of its finished product. Industry has become largely organized in trade associations for the interchange of information and the formation of a trade policy for the control both of production and distribution. It has also formed many export associations through which numerous corporations jointly solicit foreign customers, divide the resulting orders, and control the flow of goods to foreign markets. Industry has found that very large units are needed to utilize mass production methods of manufacture, thereby cheapening the product and increasing the sale; to control the market for the product through volume of sale and to eliminate as many middlemen as possible; and to reduce overhead expense both in production and distribution. The great size of corporations has simplified their financing problems. The major share of their financing is through the sale of stock which greatly reduces interest charges and debts and secures them the money they need on a basis where they pay for it only when they make profits. The results of these various policies of industry have been numerous and valuable to it. Through these trade and export associations intimate contact has been established with all the factors of the industry from the producer of raw material to the consumer of the finished product. We can give agriculture the machinery for establishing such cooperation with the industries which use its product. We can also give it an export trade organization such, for example, as is now used by the copper industry."

In outlining his program for limited tariff revision, instead of a general revision, the President said it should cover those industries which have been affected by unemployment due to competition of foreign products. The House Ways and Means Committee, which has been considering the subject since early in January, and which refers to the plan as one of "tariff readjustment" expected to have the new bill ready for action by the House the last part of April.

A number of mining measures appeared in the first batch of bills introduced in the opening days of the session. Most of them were introduced in a previous Congress but failed of action. One of these measures is the Douglas bill authorizing patents to mineral lands without showing a discovery in the case of minerals at depth. The proposal to restrict Mexican immigration was reintroduced. Other old measures making their reappearance authorize the lease of the Muscle Shoals power and nitrate project, creating a safety division in the Department of Labor, repeal of the law permitting persons to be adjudged bankrupts, for a waterway from the Lakes to the Atlantic by way of the St. Lawrence Canal, to restrict court injunctions in labor disputes, for the sale of coal lands of Indians in Oklahoma, for a miners hospital in Montana, to develop power on Indian irrigation projects, to prevent the transportation of stolen property, for relief of children in strike areas, preventing railroads from charging more for a short haul than for a long haul, for a mine rescue station at Terre Haute, Ind.; to stabilize the purchasing power of money and to restrict profits in war by conscripting materials and resources.

The authority of the President to restrict the issuance of permits and leases under leasing law, by his recent oil conservation policy, was the subject of a resolution, which provides for an investigation by a Senate Committee as to the legality of such action.

The following is a summary of bills introduced in the new session:

MINERAL LANDS

H. R. 1019. Mr. Douglas (Dem., Ariz.). This bill authorizes the issuance of patents for land containing at depth, copper, lead, zinc, gold, or silver and their associated minerals without showing an actual discovery of minerals. The patents will be to tracts of 320 acres.

STOLEN PROPERTY

H. R. 119. Mr. LaGuardia (Rep., N. Y.). This bill proposes to prohibit the sending and receipt of stolen property through interstate and foreign commerce. The Post Office Department says this bill would cover minerals and metals, for which western producers have been seeking a Federal high grading act. The bill is known as the National Stolen Property Law, and was reported by the Judiciary Committee in the last Congress, and was slated for action, but was prevented by pressure of other bills.

H. R. 5. Mr. Fenn (Rep., Conn.); S. 2, Mr. Jones (Rep., Wash.). These bills provide for the taking of a census of mines, population, distribution, agriculture, irrigation, and drainage in 1930 and every 10 years thereafter. The House bill was referred to the Census Committee and the Senate bill to the Commerce Committee.

MINE STATION

H. R. 725. Mr. Johnson (Rep., Ind.). This bill appropriates \$7,800 for establishment of a mine rescue station at Terre Haute, Ind. Mines and Mining.

H. R. 151. Mr. Leavitt (Rep., Mont.); S. 104, Mr. Walsh (Dem., Mont.). These bills propose to appropriate \$1,943,200 for construction of a highway from Red Lodge, Mont., to the boundary of the Yellowstone National Park near Cooke City, Mont. The bill would benefit the shipment of mineral products. The House bill was referred to the Roads Committee and the Senate bill to the Post Office Committee.

H. R. 112. Mr. Burtress (Rep., N. Dak.). This bill proposes to stabilize the buying power of money. The value of the dollar would be based on commodity prices determined by a monetary standard division in the Treasury Department. Banking and Currency.

H. R. 965. Mr. Goldsborough (Dem., Md.). This bill is similar to the foregoing, except that the commodity prices would be computed by the Department of Labor. Banking and Currency.

H. Res. 20. Mr. Reid (Rep., Ill.). This resolution provides for an investigation of credit restriction activities by the Federal Reserve Board. Rules.

H. J. Res. 41. Mr. Wainwright (Rep., N. Y.). This resolution proposes to equalize the burdens and minimize the

profits of war and authorizes a commission composed of representatives of the Government, labor, industry, capital, and the professions, to investigate and report in December as to the policy to be carried out in future emergencies. Rules.

S. Res. 10. Mr. Oddie (Rep., Nev.). This resolution authorizes the Senate Mines and Mining Committee to hold hearings during the new Congress, ending March 4, 1931. Expenses.

S. 142. Mr. Oddie (Rep., Nev.). This bill authorizes the remodeling of the mint and assay office at Carson City, Nev., for the use of other government agencies. Public Buildings.

H. R. 210. Mr. Taylor (Dem., Colo.). This bill proposes to grant 50,000 acres of land for use of the Western State College at Gunnison, Colo. Public Lands.

S. 145. Mr. Oddie (Rep., Nev.); H. R. 1394, Mr. Arentz, (Rep., Nev.). These bills authorize the reopening of the land office at Elko, Nev., recently discontinued by the Interior Department. Public Lands.

H. R. 209. Mr. Taylor (Dem., Colo.). This bill proposes to establish a land office at Glenwood Springs, Colo. Public Lands.

H. R. 247. Mr. Sutherland (Rep., Alaska). This bill proposes to validate mineral land entries made at the Nome, Alaska, land office by the Hammon Consolidated Gold Fields Corporation, and by Andrew Anderson and Fred M. Johnson. Public Lands.

MINERS' HOSPITAL

H. R. 152. Mr. Leavitt (Rep., Mont.). This bill proposes to grant 2,000,000 acres of land in Montana for the benefit of its educational institutions, 100,000 acres for the benefit of a state hospital for disabled miners and 100,000 acres for the benefit of the Montana State Soldier's Home. Public Lands.

H. R. 986. Mr. Hastings (Dem., Okla.). This bill provides for the sale of the remainder of the coal and asphalt deposits in the segregated mineral lands of the Choctaw and Chickasaw Indians in Oklahoma. The sale would be of lands which are leased or unleased and would be at public auction to the highest bidder under regulations of the Interior Department at not less than the reappraised value. If the lands are not sold at two public auctions they may be sold at less than the reappraised value, or the department may grant options of six months to purchase the coal with the right to make tests and borings to determine the nature and extent of the mineral deposits. If the lands are not sold after three public auctions and after two reappraisals the lands may be sold regardless of the last reappraised value. Payment for the lands if sold will be made within five years. Indian Affairs.

S. 206. Mr. King (Dem., Utah). This bill proposes to cede to the states the unreserved non-mineral public lands to the states. Mines and Mining.

MINERAL LEASE INQUIRY

S. Res. 17. Mr. King (Dem., Utah). This resolution calls for an investigation by the Senate Judiciary Committee as to the legality of the new oil conservation policy of the President.

H. R. 239. Mr. Sinclair (Rep., N. Dak.). This bill establishes the Killdeer Mountain National Park in North Dakota, but provides that this act shall not affect any valid existing claim, location or entry under the mineral land laws. Public Lands.

LABOR SAFETY

H. R. 995. Mr. Hogg (Rep., Ind.). This bill creates a division of safety in the Bureau of Labor Statistics of the Department of Labor for the purpose of promoting safety in industry. The bill prescribes the duties of the division.

H. R. 144. Mr. LaGuardia (Rep., N. Y.). This bill creates a Federal Child Relief Board, to administer relief for children in distress in strikes in the bituminous coal mines, children of unemployed persons and of other parents in extreme poverty including children of farmers in distressed agricultural areas. The board would consist of the Secretary of Labor, the chief of the Children's Bureau of that department, and the Secretary of Agriculture. The bill appropriates \$75,000,000 for the year beginning July 1, 1930. Judiciary.

LABOR INJUNCTIONS

H. R. 122. Mr. LaGuardia (Rep., N. Y.). This bill defines combinations and conspiracies in trade and labor disputes and prohibits the issuance of court injunctions therein. Judiciary.

H. R. 132. Mr. LaGuardia (Rep., N. Y.). This bill forbids injunctions by courts against orders by administrative boards or commissions of states acting under state laws. Judiciary.

H. R. 744. Mr. Wright (Dem., Ga.). This bill authorizes the lease of the Muscle Shoals, Ala., nitrate and power project to the American Cyanamid Company and the Air Nitrates Corporation. Military Affairs.

H. R. 203. Mr. Taylor (Dem., Colo.). This bill provides for approval of the agreement between the states affected for the development of the Colorado River. Irrigation.

H. J. Res. 36. Mr. Hogg (Rep., Ind.). This resolution proposes an amendment to the Constitution giving the Government and the states authority to tax income derived from Federal and state securities. Ways and Means.

H. R. 1020. Mr. Hall (Rep., Ill.). This bill proposes to repeal the act of July 1,

1898, under which persons and corporations may go into bankruptcy. Judiciary.

S. 164. Mr. Bingham (Rep., Conn.). This bill provides that preference shall be given to domestic materials in the purchase of military and naval supplies by the Government. Military Affairs.

TRANSPORTATION MEASURES

H. R. 100. Mr. Kelly (Rep., Pa.). This bill provides that only steel cars shall be used in the railway postal service after January 1, 1930. Railway postal cars used by independent short line railroads must be of steel construction after January 1, 1932. Post Office.

S. 221. Mr. Brookhart (Rep., Iowa). This bill establishes an eight-hour day for railroad yardmasters. Interstate Commerce.

H. R. 3. Mr. Summers (Rep., Wash.). This bill authorizes the Interstate Commerce Commission to assign cases for decision to an individual member of the commission or to boards composed of employes of the commission. Interstate Commerce.

H. R. 207. Mr. Taylor (Dem., Colo.). This bill provides that railroads shall not charge less for a longer haul than for a shorter haul in the same direction. Interstate Commerce.

H. R. 733. Mr. Mapes (Rep., Mich.). This bill appropriates \$100,000 as a start on the construction of a deep waterway for ocean-going vessels from the Great Lakes to the Atlantic Ocean by way of the St. Lawrence River and the Welland Canal. Interstate Commerce.

H. J. Res. 37. Mr. McLeod (Rep., Mich.). This resolution expresses the readiness of the Government to proceed with the development of the Great Lakes-St. Lawrence waterway, as soon as Canada approves the project. Interstate Commerce.

H. R. 1012. Mr. Peavey (Rep., Wis.). This bill provides for maintaining the level of the Great Lakes and the issuance of permits for diversion of water from them by the War Department only on proof that every other engineering and economic means has been used to provide the water desired. Rivers and Harbors.

IMMIGRATION RESTRICTION

S. 51. Mr. Harris (Dem., Ga.). This bill proposes to subject Mexico and other countries of the western hemisphere, except Canada, to the 2 percent quota immigration restriction law, effective July 1, 1930. Immigration.

S. 52. Mr. Harris (Dem., Ga.). This bill reduces immigration to the basis of 1 percent of aliens in the United States in 1890 instead of 2 percent as at present, effective July 1, 1930. Immigration.

H. R. 195. Mr. Douglass (Dem., Mass.); H. R. 1239, Mr. Schafer (Rep., Wis.); S. 151, Mr. Walsh (Dem., Mass.). These

IMPORTANT BILLS REVIEWED IN THIS ISSUE

Mining

- H. R. 1019—Douglas (D., Ariz.). Patents to Mineral Lands At Depth.
- H. R. 119—La Guardia (R., N. Y.). Prohibit Commerce in Stolen Property.
- H. R. 5—Penn (R., Conn.). Census of Mines, Distribution and Population.
- H. R. 725—Johnson (R., Ind.). Terre Haute Mine Rescue Station.
- H. R. 112—Burtess (R., N. Dak.). Stabilize Purchasing Power of Money.
- H. R. 152—Leavitt (R., Mont.). Miners Hospital in Montana.
- H. R. 986—Hastings (D., Okla.). Sale of Indian Coal Lands.
- S. 206—King (D., Utah). Code Land to States.
- S. Res. 17—King (D., Utah). Mineral Lease Inquiry.

Labor

- H. R. 995—Hogg (R., Ind.). Division of Labor Safety.
- H. R. 144—La Guardia (R., N. Y.). Strike Relief.
- H. R. 122—La Guardia (R., N. Y.). Court Injunction Restriction.

Power

- H. R. 741—Wright (D., Ga.). Lease of Muscle Shoals Project.
- H. R. 157—Leavitt (R., Mont.). Power Development on Indian Irrigation Projects.
- H. R. 203—Taylor (R., Colo.). Colorado River Project Approval.

Transportation

- H. R. 100—Kelly (R., Pa.). Steel Cars in Railway Postal Service.
- H. R. 3—Summers (R., Wash.). Decision by Interstate Commerce Commission.
- H. R. 207—Taylor (D., Colo.). Long and Short Haul Charges.
- H. R. 733—Mapes (R., Mich.). St. Lawrence Waterway Project.
- H. R. 121—La Guardia (R., N. Y.). Liability of Vessel Owners.

Immigration

- S. 51—Harris (D., Ga.). Mexican Restriction.
- S. 52—Harris (D., Ga.). Quota Limitation.

bills propose to repeal the national origin method of establishing immigration quotas. Immigration.

H. R. 961. Mr. Douglas (Dem., Ariz.); S. 206, Mr. Hayden (Dem., Ariz.). These bills authorize the issuance of certificates of arrival to persons born in the United States who are now aliens. Immigration.

H. J. Res. 20. Mr. Stalker (Rep., N. Y.); S. J. Res. 4, Mr. Tyson (Dem., Tenn.). These resolutions propose an amendment to the Constitution, to exclude aliens in counting the number of persons in each state for whom members of Congress are elected. Judiciary.

H. R. 9. Mr. Kvale (Rep., Minn.); H. R. 32, Mr. Andresen (Rep., Minn.). These bills fix the immigration quotas on the basis of 2 percent of the number of foreign born in the United States in 1890. Immigration.

S. J. Res. 10. Mr. Fletcher (Dem., Fla.). This resolution proposes an amendment to the Constitution to provide for four-year terms for members of the House instead of two-year terms as at present. Judiciary.

H. R. 99. Mr. Kelly (Rep., Pa.). This bill provides that the members of the President's Cabinet shall attend sessions of the Senate and House and participate in debate on matters relating to the business of their departments of the Government. Judiciary.

SENATE COMMITTEES

Senator Patterson (Rep., Mo.) is the only new member of the Senate Mines

and Mining Committee as reorganized for the new Congress. Senator Oddie (Rep., Nev.) continues as chairman, and the other members are as follows: Goff, W. Va.; La Follette, Wis.; Robinson, Ind.; Frazier, N. Dak.; and Thomas, of Idaho, Republicans. Walsh, Mont.; Ashurst and Hayden, Ariz.; Pittman, Nev.; and King, Utah, Democrats.

Senator Smoot (Rep., Utah) continues as chairman of the Finance Committee, which will handle the new tariff bill and any tax legislation that may develop. New Senators on this committee are: Bingham, Conn., and Sackett, Ky., Republicans; and Connally, Tex., Democrat. The other members are: Watson, Ind.; Reed, Pa.; Shortridge, Calif.; Edge, N. J.; Couzens, Mich.; Green, Vt.; Deene, Ill.; and Keyes, N. H., Republicans. Simmons, N. C.; Harrison, Miss.; King, Utah; George, Ga.; Walsh, Mass.; Barkley, Ky.; and Thomas, Okla., Democrats.

Senator Couzens (Rep., Mich.) is the new chairman of the Interstate Commerce Committee, replacing Senator Watson (Rep., Ind.), who is the new floor leader in the Senate, although Senator Watson retains second place on the committee. New members on this committee are: Brookhart, Iowa, and Kean, N. J., Republicans; and Tydings, Md., and Barkley, Ky., Democrats. Senator Black (Dem., Ala.) was not reappointed to the committee. The other members of the committee are: Fess, Ohio; Howell, Nebr.; Goff, W. Va.; Pine, Okla.; Sack-

ett, Ky.; Metcalf, R. I.; and Glenn, Ill., Republicans. Smith, S. C.; Pittman, Nev.; Dill, Wash.; Wheeler, Mont.; Hawes, Mo.; and Wagner, N. Y., Democrats.

Senator Norbeck (Rep., S. Dak.) becomes chairman of the Banking and Currency Committee, succeeding Senator McLean (Rep., Conn.), who retired from the Senate. New members on this committee are: Senators Goldsborough, Md.; Herbert, R. I.; Townsend, Del.; and Walcott, Conn., Republicans; and Connally, Tex., Democrat. Senators Sackett (Rep., Ky.), Frazier (Rep., N. Dak.), and Pine (Rep., Okla.) retired from this committee. The other members of the committee are: Edge, N. J.; Phipps, Colo.; Brookhart, Iowa; Steiwer, Oreg.; and Thomas, Idaho, Republicans. Fletcher, Fla.; Glass, Va.; Wagner, N. Y.; Barkley, Ky.; and Tyson, Tenn., Democrats.

Senator Metcalf (Rep., R. I.) becomes chairman of the Labor Committee, succeeding Senator Phipps, who becomes chairman of the Post Office Committee, but retains membership on the Labor Committee. New members on the Labor Committee are: Burton, Ohio; and Walcott, Conn., Republicans. Other members of the committee are: Borah, Idaho; Couzens, Mich.; and Gillett, Mass., Republicans. Copeland, N. Y.; Tyson, Tenn.; and Walsh, Mass., Democrats.

The Immigration Committee chairmanship is retained by Senator Johnson (Rep., Calif.). The only new member is Hatfield (Rep., W. Va.). The other members are: Keyes, N. H.; Reed, Pa.; Nye, N. Dak.; Gould, Me.; Watson, Ind., Republicans. King, Utah; Harris, Ga.; Copeland, N. Y.; Blease, S. C.; and Stephens, Miss., Democrats.

Senator Frazier (Rep., N. Dak.) continues as chairman of the Indian Affairs Committee, the only new member of which is Walcott (Rep., Conn.). Senator Jones (Rep., Wash.) retires from this committee. The other members of the committee are Schall, Minn.; McMaster, S. Dak.; La Follette, Wis.; Pine, Okla.; Steiwer, Oreg., Republicans. Ashurst, Ariz.; Kendrick, Wyo.; Wheeler, Mont.; Bratton, N. Mex.; and Thomas, Okla., Democrats.

The Judiciary chairmanship is retained by Senator Norris (Rep., Nebr.), new members on which are Hastings, Del., and Burton, Ohio, Republicans; and Dill, Wash., Democrat. The other members are: Borah, Idaho; Deneen, Ill.; Gillett, Mass.; Robinson, Ind.; Blaine, Wis.; Steiwer, Oreg.; and Waterman, Colo., Republicans. Overman, N. C.; Ashurst, Ariz.; Walsh, Mont.; Caraway, Ark.; King, Utah; and Stephens, Miss., Democrats.

The Committee on Manufactures has a

new chairman, Senator La Follette (Rep., Wis.), succeeding Senator McLean, retired. Senator Gould (Rep., Me.) retires from this committee. New members on the committee are: Hale, Me.; Goldsborough, Md.; Hatfield, W. Va., Republicans; and Sheppard, Tex., Democrat. Other members on the committee are: McNary, Oreg.; Metcalf, R. I.; Deneen, Ill., Republicans. Smith, S. C.; Wheeler, Mont.; and Tyson, Tenn., Democrats.

Senator Waterman (Rep., Colo.) succeeds Senator Metcalf (Rep., R. I.) as chairman of the Patents Committee, new members of which are: Goldsborough, Md., and Hebert, R. I., Republicans. The other members of the committee are: Norris (Rep., Nebr.) and Smith, S. C.; Broussard, La.; and Dill, Wash., Democrats. Senators Metcalf and Shipstead (F. L., Minn.) retired from this committee.

Senator Nye (Rep., N. Dak.) continues as chairman of the Public Lands Committee, and new members on which are: Glenn, Ill., and Cutting, N. Mex., Republicans. Senator Dill (Dem., Wash.) retires from this committee, the other members of which are: Smoot, Utah; Norbeck, S. Dak.; Oddie, Nev.; Dale, Vt.; McNary, Oreg., Republicans. Pittman, Nev.; Kendrick, Wyo.; Walsh, Mont.; Ashurst, Ariz.; Wagner, N. Y.; and Bratton, N. Mex., Democrats.



PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

GUY N. BJORGE

Editor

*Practical Operating Problems
of the Metal Mining Industry*



DRILLING *A Round Hole in Rock* *with the Modern Hammer Drill*

By GEORGE H. GILMAN *

A discussion of the fundamentals, essential requisites, and practical problems incident to present-day rock drilling practice and drills—The balanced independent motor a basic feature of standardization

LONG before the white man discovered America, his predecessor, the American Indian, practiced the drilling of a round hole in rock. Eyes were drilled in round stones, to which were affixed handles or thongs by which the stones were wielded, either as weapons or for domestic use.

A knowledge of the exact method employed for drilling these holes has never been definitely established, although by archaeologists it is commonly accepted as facts that such holes were formed by spinning a pointed shaft, also of stone, upon the piece to be worked—a method similar to that employed by the boy scout of today when kindling a wood fire in the absence of matches, except that the Indian employed water for augmenting the abrasiveness of the spindle.

Today, after evolution through the intervening years, the same fundamental method is practiced, with the exception that man, through a knowledge of the relative resistance to abrasion of different rocks and metals, and by virtue of the development of mechanical means for applying pressure and rotation torque to the shaft, has by the employment of a spindle studded with diamonds and rotated under pressure succeeded in driving a round hole through hard rock for a

distance of over a mile. Such a method is commonly termed "diamond drilling," and is mainly employed for prospecting. It is too slow and expensive a method to employ for the drilling of holes in rock preparatory to blasting, due to the fact that during the past 100 years the development of the percussive steel drill has been carried to a point which renders practicable by such means the drilling of round holes to a maximum vertical depth of 40 ft. and at a maximum penetrative rate, depending upon the hardness of the rock and the size of the drill bit, of 36 in. per minute.

The fundamentals of such a rock-drilling machine consist of a hollow steel drill rod equipped at its forward end with a properly shaped and heat-treated bit having both cutting and reaming qualities, and at the rear end with a shank also properly heat-treated and adapted to be acted upon by percussive means, commonly known as a hammer engine.

This hammer engine performs three distinct functions upon the drill steel:

- (a) Delivers hammer blows in rapid succession.
- (b) Rotates the drill steel a fraction of a revolution between hammer blows.
- (c) Admits either a jet of water, or air, or both, under pressure to the tu-

bular drill steel, for the purpose of ejecting the rock cuttings from the drill hole.

The character of the rock and the requirement determines the size and shape of the drill steel, and the three foregoing fundamentals of the hammer engine must of necessity be varied to most advantageously accomplish the desired result. Provision must also be made for mounting the drilling machine in proper relation to the work and for feeding and retracting the drill steel to and from the drill hole. These determinations comprise the work of the rock-drilling engineer who, by an analysis of the conditions, establishes the requirement of the drilling engine.

The primary step is to determine the conditions of the work, and to this end the following important factors are considered:

(A) The character of the rock from a drilling viewpoint, which may be classified as follows:

- (1) Cutting rocks which as a rule are not abrasive, such as talc, clay and marble.
- (2) Chipping rocks which may or may not be abrasive, such as flint.
- (3) Crushing rocks which are invariably abrasive, such as sandstone, granite, quartz, etc.

(B) The smallest permissible diameter

* President, Gilman Manufacturing Company.

and the depth of the hole to be drilled, which may be determined by:

(1) The kind of work to be performed, such as drifting, stoping, sinking and raising in mines, quarry bar drilling in quarries and ordinary blast hole drilling in open-cut excavation.

(2) The degree of ease with which the rock may be broken to the required size by blasting.

(3) Type, strength and diameter (if in cartridge form) of the explosive to be used.

(4) Requirements of the drill hole when employed in quarries for the removal of dimension stone from the mass.

(C) Cost of available labor—this to a degree influences the practicability of employing either a one-man or a two-man rock drill.

(D) Cost of compressed air and the available air pressure. Usually the former has an economic determining influence upon the latter and the factors may be summarized as follows:

(1) Cost of electricity, steam or water power.

(2) Altitude.

(3) Available compressor capacity.

Having determined the conditions of the work from a drilling viewpoint, he must now establish the essential requisites of the drilling machine, which are as follows:

Primary requisites:

(1) Force and frequency of the hammer blow.

(2) Rotation torque and revolutions per minute of the drill steel.

(3) Drill hole cleaning facilities as provided by the drilling engine to insure the rock particles being removed from the drill hole immediately they are disintegrated by the action of the drill bit.

Secondary requisites:

(4) Air consumption of the rock-drilling engine.

(5) Upkeep cost.

(6) Convenience of handling.

FORCE AND FREQUENCY OF HAMMER BLOW

Under conditions where maximum footage of drill hole per unit of time is desired, force and frequency of the hammer blow is the factor of primary importance, and therefore the rock drill to be selected should deliver the maximum force of blow and as frequently as the conditions of the work will permit. Force of blow is determined by the effective diameter of the hammer piston, its weight, the distance through which it travels when being acted upon by the propelling force and the pressure of the motive fluid at different points of its stroke, all of which may be expressed by

the formula $1/2 MV^2$. Therefore it will be seen that by reducing the diameter of the hammer piston and increasing its length of stroke, a given force of blow may be maintained or the same result is obtainable by increasing the mean effective pressure in the cylinder with a reduction in weight of the hammer piston, or vice versa. However, frequency of hammer blow is a very important factor in disintegrating the rock particles, and as the velocity of the compressed air varies with the pressure and wire-drawing or friction of the air is governed by its velocity, size and directness of the passages through which it travels; the permissible length of stroke for a given frequency of blow is approximately fixed, other factors remaining constant.

It may, therefore, be assumed that the required force of blow of a rock-drilling machine and its frequency should be as great as the selected drill steel will withstand without undue wear or breakage, and as the diameter of the drill steel is governed largely by the diameter of the drill hole and the character of the rock to be drilled, it normally determines whether a one-man or a two-man rock drill should be employed for the work in hand.

American practice with modern hammer drills of the mounted type has decreed that the maximum weight of a rock drill, which can be conveniently and effectively handled under ordinary column bar conditions by two men (the drill runner and his helper), should not exceed 200 pounds, and that the practicable weight of the "one-man" mounted type of hammer rock drill is 125 pounds. With these weight limits for general guidance, the practicability of developing a modern "two-man" hammer rock drill which will deliver a 100-ft. pound blow 2,200 times a minute under 100 pounds air pressure at the throttle of the drill has been demonstrated, and likewise it has been found thoroughly practicable to construct a "one-man" drill of corresponding type, which will deliver a 65-ft. pound blow under similar conditions 2,300 times a minute. The product of the force and frequency of blow per minute expresses the energy of the hammer piston transmitted to the drill steel in foot pound minutes.

In rock of medium drilling hardness, the present-day round section hollow straight carbon drill steel of 1 1/4-in. diameter will transmit, when equipped with a cross drill bit of 2 1/4-in. maximum gauge diameter, a 110-ft. pound blow delivered 2,200 times per minute without undue bending or breakage, whereas in hard-drilling rock, a round section hollow drill steel of similar chemical composition should be 1 1/4 in. in diameter to insure corresponding stamina. Likewise, it has been determined that a round sec-

tion hollow drill steel of 1-in. diameter will withstand, when equipped with a cross drill bit of 1 1/4-in. gauge diameter in rock of medium hardness a 65-ft. pound blow delivered 2,300 times per minute without undue bending or breakage. In harder rock, a straight carbon hollow drill steel, in order to withstand this abuse to a corresponding degree, should be 1 1/4 in. in diameter. It follows, therefore, that if the air pressure is reduced in machines that are designed to transmit a power output corresponding to the foregoing, the use of a smaller drill steel is permissible, but the rate of penetration is reduced with a consequent decrease in the amount of free air consumed per minute. As a rule, the penetrative rate of a rock-drilling machine when operating under air pressure of 70 pounds is but one-half of that secured when the drill is caused to operate under 100 pounds pressure. Even this will vary with the weight of the drill through which the blow is transmitted. When long steels of heavy section are employed, the relative reduction in rate of penetration is even more pronounced, due to the absorption of energy by transmission through the bar.

It must be borne in mind that it is possible to increase the frequency of the hammer blow to a point where drill bits made from the present-day straight carbon hollow drill steel are not adequate to withstand the heat thus generated in the bottom of the drill hole without drawing the temper. This applies mainly to hard abrasive ground, such as granite, whereas in soft unabradable ground, such as talc, frequency of hammer blow to the extent of 4,000 per minute is thoroughly practicable and has resulted in a very high rate of penetration.

ROTATION OF THE ROCK DRILL STEEL

Regardless of the shape of the rock drill bit employed on the end of the drill bar, to drill a round hole it must of necessity be turned a part of a revolution after the delivery of each hammer blow, in order that the cutting edges of the bit will be presented to an unfractured surface of the material to be disintegrated, and since 1858, when Lewis Schawartkorf and Ferdinand Carl Philippson jointly conceived the idea of employing a pneumatic hammer to both rotate and deliver a succession of hammer blows upon the head of the drill steel, instead of the manually wielded sledge previously used for the purpose, inventors have struggled with the problem of devising a mechanical means that would satisfactorily rotate the drill bit between hammer blows.

To the layman, the problem is one that should be easy of solution, but to the engineer skilled in the design of rock-drilling machinery there is presented a

combination of obstacles difficult to surmount, due to the conditions under which it must operate.

First—It must develop a rotation torque of sufficient strength to rotate the drill steel under load, as in the case of a badly fitted, muddled, or deflected drill hole, but the developed torque must not be so great as to exceed the factor of safety of the drill steel.

Second—It must of necessity withstand indefinitely, without wear or breakage, the severe vibratory stresses and shocks to which any piece of mechanism entering into the make up of a rock drill is subjected.

Third—It should be of such a nature that when the drill steel is stalled there is exerted upon it a constant torque tending to turn it, regardless of whether the hammer piston is in motion or at rest. Such a feature is desirable when the drill bit is working through a soft seam or when it is necessary to ream an undersized drill hole to permit the following steel to bottom without wear of its reaming qualities and without the assistance of a sledge hammer.

Fourth—It should be of the lightest possible weight, and very simple in construction.

Fifth—It should perform its function with a minimum consumption of power.

In the early models of hammer rock drills, the ratchet and pawl were employed for the purpose by having the ratchet head mounted upon the chuck into which the shank of the drill steel was seated, and where it was engaged by a lever-actuated pawl and pawl spring, adapted to be oscillated by contact with a reciprocating part of the hammer engine. This turned the drill steel step by step only when the reciprocating parts were in motion, but when it became

bound in the drill hole the retarding effect was transmitted back to the parts upon which the motive power was applied. For many succeeding years the ratchet, although coming far short of meeting the requirement, was universally employed and found its greatest field of practicability when used in the reversed form, which consisted of a loosely mounted ratchet supported in the back head of the drilling engine with its integral rifle bar extending into the cylinder, and over a part of which was adapted to reciprocate the hollow rifled piston head of the reciprocating rock drill, so called, by virtue of the fact that the drill steel bar with its cutting bit was rigidly fastened to the extended piston rod of the engine. Later when the reciprocating drill was converted by its manufacturers into an engine of the hammer type it was but necessary to establish a slip joint connection between the abbreviated piston rod of the hammer and the loosely mounted drill chuck, held in the front head of the cylinder to transmit rotation from the hammer piston to the chuck, this being accomplished by a series of longitudinal splines formed upon the end of the hammer bar extension and with corresponding grooves cut in the drill chuck.

Many attempts were made by those pioneer inventors who blaze the trails leading to the invention of successful devices to develop a practicable mechanical device for turning the loosely mounted chuck and drill steel of a hammer rock drill, independent of its piston hammer or other reciprocating part, but it was not until 1898, when Alfred P. Schmucker, of Denver, Colo., built a hammer rock drill in which the drill steel was rotated by an independent motor, and put it to work in the mines at Crip-

ple Creek and Leadville, Colo., that we have record of the first practical machine of this type developed in America. This machine was not commercially successful, but later, in 1902, Schmucker developed another hand-held hammer rock drill and equipped it with an independent motor of another type, comprising a transversely mounted reciprocating piston to which was loosely attached the extended arm of a ring-faced ratchet, which engaged the drill chuck. This machine was the progenitor of one which later met with some degree of commercial success.

In subsequent years many types of drills having motors of different kinds for turning the drill steel independently of the hammer piston were placed on the market, as operators were keen to recognize the advantages that accrue from such a system, but these machines were doomed to failure in two major respects:

First, because of inability to produce a motor that would withstand, without undue wear or breakage, the service to which it was unavoidably subjected in practical operation.

Second, due to difficulty in devising a simple and practicable gear for reducing the high speed of the motor to the relatively low speed of the drill chuck, and at the same time construct the motor in such a manner that, regardless of whether the motor parts were in motion or at rest, there would be a constant torque applied to the drill steel when compressed air was admitted to the power surfaces.

The major cause of these weaknesses may be attributed to the fact that the motors were not balanced. In other words, the various parts of the motor and its reduction gear were subjected to pressure from some particular direc-



Pneumatic feed drifter drill with balanced independent motor rotation. Weight, 125 lbs. This drill, which is manufactured in several different sizes, automatically holds the machine in proper relation to the work, and but

an instant is required to retract the run drill steel from the drill hole. Under any conditions the footage per man shift is doubled by the use of this device.

tion, which was of necessity carried by the axial bearings of these parts. When these bearings wore there resulted undue leakage of compressed air by the working surfaces of the motor, with a resultant loss in effectiveness and an abnormal increase in air consumption.

In 1922 there was placed upon the general market a hammer rock drill having a balanced motor with a balanced reduction gear, all of which was completely divorced from the hammer piston. The subsequent success of this rock drill has demonstrated how completely the foregoing stipulations of the requirement have been met.

Revolutions per minute and rotation torque of the rock drill steel should, within permissible limits, be varied with the size of the drill bit and the abrasiveness of the ground, for it is the peripheral speed of the reaming qualities of the drill bit which determines, in conjunction with the abrasiveness of the ground being drilled, the degree of wear to which the drill bit is subjected. In tight drilling ground—that in which the normal chattering action of the drill bit does not cut a clearance for itself by loosening the rock particles from the side wall of the drill hole—a stronger rotation torque is necessary than when working in ground the rock particles of which disintegrate more freely. There is a limit, however, beyond which it is unsafe to go with rotation torque without danger of increasing the tendency to break the drill steel bar or the wings of the drill bit by torsional and vibratory stress. In practice, it has been found unsafe to provide a maximum rotation torque in excess of one-half horsepower for the two-man rock drill and of 4/10 horsepower for the one-man size of rock drill referred to.

The peripheral speed of the drill bit should, as has been indicated, be varied with the character of the ground, for whereas in soft, unabrasive ground a peripheral speed of 100 ft. per minute is permissible, in abrasive ground, such as sandstone, and hard abrasive ground, such as quartz, a peripheral speed of 50 ft. per minute is all that the present-day

straight carbon rock drill bits will withstand without undue wear. A desirable rock drill should, therefore, embody means whereby the mechanism for turning the drill steel may be varied both as applied to rotation torque and revolutions per minute, in order that it may be adapted to meet most advantageously the conditions of any particular operation.

THE BALANCED INDEPENDENT MOTOR AND REDUCTION GEAR

The balanced rotation engine and the speed-reducing gear referred to rotate the drill steel the required number of revolutions per minute and apply the proper rotation torque for the conditions of the work. By use of this device, the rotation of the drill steel is divorced entirely from the hammer piston, having no connection with it whatsoever. The hammer piston, therefore, performs no function other than that of delivering the proper force and frequency of blow upon the drill steel. It is free to revolve in the cylinder at will, and by virtue of the absence of grooves, splines, or threads in its bore or upon its periphery it is made to cushion upon live air at both ends of its stroke.

It permits of varying the rotation torque and number of revolutions of the drill steel to most advantageously meet the drilling conditions, and due to the hammer piston being made in a solid bolt without longitudinal grooves, counterbores, or threads—the principal cause of breakage—there is thus eliminated the loss of compressed air, which invariably occurs in those types of drills which employ a hollow hammer piston adapted for sliding engagement over the extended rifle bar. In the rifle bar and ratchet type of drill this hollow well, or counterbore, in the hammer piston is of necessity filled once each stroke with compressed air at cylinder pressure, which is later exhausted to the atmosphere without performing any beneficial effect upon the hammer.

The steady rotation torque exerted by the independent motor upon the drill steel as compared to the intermittent application of force obtained from the rifle

bar and ratchet method reduces breakage of steel to the lowest point, and by no better way than the employment of the balanced independent motor is there rendered interchangeable a variety of hammer cylinders of different diameters and lengths of stroke merely by the substitution of but a cylinder with its hammer piston and without affecting other parts of the drilling machine. This feature of standardization lends itself admirably to those operations under one management where the variable rock conditions demand a different force and frequency of blow to most advantageously meet the requirement.

The power consumed by the rotation engine is less than that consumed for the work of rotating the drill steel by any other known means, and the absence of frictional resistance of its moving parts accounts in a measure for the fact that its efficiency is higher than that of any other mechanical rotation device that has been employed in practice.

So complete is the balance of all parts entering into the make-up of the balanced motor rotation mechanism that, with ordinary care and attention, wear and loss of efficiency after long use is a negligible quantity.

Many of these rock drills have to their credit the drilling of upwards of 100,000 ft. of drill hole under severe conditions without necessitating the expenditure of one cent for repairs to those parts that comprise the rotation motor and its speed-reducing gear. Recently an investigation was made of 10 rock drills having the balanced independent motor rotation feature after each had been in operation for a period of one year under adverse rock drilling conditions. This investigation disclosed the fact that the rotation power output of each machine had not lessened during the entire time period of operation, and that this accomplishment was realized with all the original parts other than a few bearings.

The balanced motor, as shown by the accompanying sketch, is located either at the front or the rear of the hammer engine, where it surrounds the cylinder. Power is transmitted to the drill chuck by two shafts, one on each side and spaced diametrically opposite, both of



Drifter type hammer rock drill with balanced independent motor for turning the drill steel. Weight, 125 lbs.

which rotate in the same direction. The desired reduction in revolutions between the shafts and the chuck is secured by two gyrating yokes having internal teeth which engage the chuck at points diametrically opposite. These yokes are connected to each shaft by means of an eccentric, and as the shafts rotate in unison, a gyrating motion is thus imparted to the yokes, which are at all times in mesh with the teeth of the chuck sleeve. The difference in the number of teeth between the yoke and the chuck sleeve determines the extent to which the number of revolutions is reduced, and incidentally the rotation torque transmitted to the drill steel.

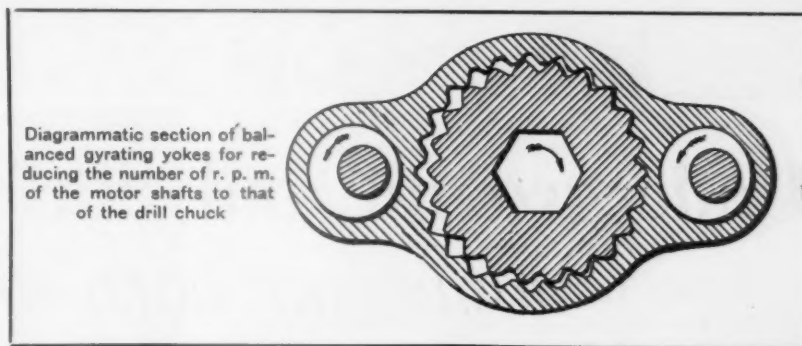
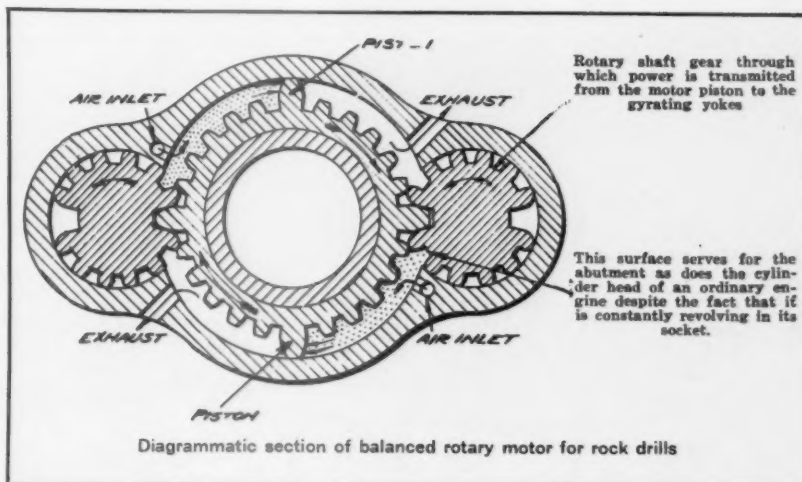
The upkeep or maintenance cost of hammer rock drills having the balanced independent motor rotation for the drill steel, based upon the cost per unit of rock removed from the drill hole, has been found to be materially lower than that of other types of rock drills of corresponding capacity when operating under the same conditions. Many factors have contributed to this result, chief of which is the perfect balance of all operating parts and the fact that the rotation mechanism is divorced completely from the hammer piston.

Divorcing the rotation mechanism from the hammer piston renders this part free floating, with no duty to perform other than that of delivering its blow upon the drill steel. Also this permits the hammer piston to be balanced to a nicety, whereas in those machines that derive their rotation power from the hammer piston through a specially fluted rifle bar and ratchet mechanism interlocked with the drill steel chuck to provide a slip-joint connection, provision is of necessity made in the stroke of the hammer piston to meet the variable load that is thus imposed upon it, and which normally results in the piston being short stroked when an overload is placed upon the drill steel, such as happens, for instance, when the drill hole is out of alignment or when an abnormally long or heavy drill steel is used.

The employment of the independent rotation mechanism also permits the hammer piston to be made from material and heat treated in a manner which practically assures it against breakage.

SLUDGING OF THE DRILL HOLE

The ejection of the rock cuttings as fast as they are disintegrated in the bottom of the drill hole is an important function of the hammer rock drill, and here again the extent to which facilities are provided to this end is dependent upon the character of the ground and the rate at which the drill bit loosens or disintegrates the rock particles. For all present-day drilling in confined places, water under pressure of from 20 to 150



pounds is conducted by a hose line to an axially mounted water tube in the back head of the machine, which extends through the hammer piston and enters the shank of the hollow drill steel for a distance of from 2 to 3 in., by which it is conducted to the bottom of the drill hole. American practice provides for the introduction of air under pressure into the hollow drill steel, thus assisting in the expulsion of rock cuttings from the drill hole, whereas the South African practice on the Rand provides for the exclusion of all air under pressure from the drill hole.

Water only, under pressure, is practicable for cleaning the cuttings from the drill hole in uniform crushing and chipping rocks, but in soft broken formations, the introduction of air under pressure to supplement the action of the water is extremely desirable, dependent upon the rate at which the rock cuttings are formed. It is, of course, undesirable to employ more air than is necessary for the purpose and, therefore, when adjusting a rock drill to meet most advantageously any fixed set of rock conditions, care should be exercised to see that no more live air is used for the purpose than that which is rendered absolutely necessary to insure a proper cleaning effect.

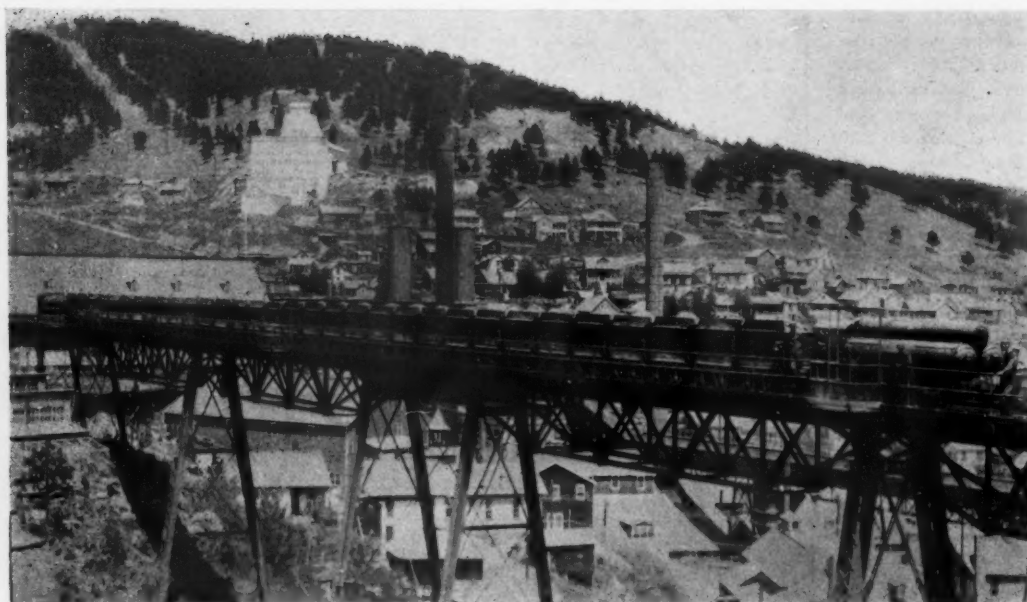
Rock drills having the balanced inde-

pendent motor rotation embody means for varying the character and amount of air required for sludging the drill hole, so that no greater volume is used for this purpose than that which is absolutely necessary to eject the rock cuttings as fast as they are made, regardless of the conditions of the work.

AIR CONSUMPTION

Under ordinary conditions, when determining hammer engine efficiency, the air consumption of a rock drill should be expressed in cubic feet of free air per cubic inch of rock removed from the drill hole instead of cubic feet per minute or cubic feet per linear foot of hole drilled. The reason for this is obvious, inasmuch as in practice the rate of penetration in rock varies nearly inversely with the square of the diameter of the drill hole, all other factors remaining constant, and therefore the amount of free air consumed by a drilling engine, operating under a fixed set of conditions, when drilling a hole of 1½-in. diameter to a depth of 12 in. is but one-half that required to drill a hole of 1¼-in. diameter to the same depth under similar conditions, and the time required is approximately one-half that of the latter, whereas the air consumed per unit of time is the same in each case.

But few hammer rock drills use compressed air (Continued on page 366)



A train of gold ore at the Homestake Mine. The new B. & M. No. 2 hoist may be seen in the background

Underground and Surface Haulage

HOMESTAKE GOLD MINING COMPANY

By R. G. WAYLAND *

Cost of haulage underground and on surface has shown yearly reduction due to improved mining methods and better track maintenance—Description of equipment

IN 1901 the underground tramping of ore, waste and equipment by mules and horses at the Homestake Mine at Lead, S. Dak., was replaced by compressed air locomotives, bringing with it increased production per man hour.

Since that time the compressed air haulage system has been increased with very satisfactory results until there are now ten 3½-ton, twenty 5-ton, two 7½-ton and two 14-ton locomotives used in the operation of the mines at Lead.

The high pressure compressed air for the haulage system is supplied by three 4-stage compressors, two electric and one steam driven located at the Ellison Hoist. The three compressors have a combined capacity of 3,784 cubic feet of free air per minute. The main 4-in. supply pipe and all branches are galvanized iron pipe, painted red to distinguish it from the low pressure air system. The average amount of air consumed by the mine for haulage is approximately one and three-fourths million cubic feet of

free air per 24 hours at an initial average pressure of 910 pounds.

In the upper levels of the mine the original horse-drawn 1-ton end-dump cars are still used, but in the lower levels that were developed after air haulage became general a 1-ton side-dump car was designed by the Homestake similar to the one shown. The side-dump cars are being equipped with roller bearings as they come to the surface for repairs and as the upper levels become worked out the use of the end-dump cars will go out of general use.

The track gauge of the underground haulage system is 18-in. while the surface track gauge is 22-in. Whenever any of the underground haulage equipment is brought to the surface for major or minor repairs it is placed on transfer trucks and delivered to the proper shops. Repairs are made in the Mechanical Department in two separate shops known as the Car Repair Shop which is under the blacksmith foreman and the Air Motor Repair Shop under the machine shop foreman.

The Car Repair Shop handles about eight cars per working day or 2,700 cars per year which is about 82 percent of the 3,300 cars operated in the air haulage system.

On the surface the ore trains are handled by one 14-ton and one 8½-ton air locomotive. The 14-ton engine is used principally to haul ore to the mills, known as the Amicus Mill and the South Mill, while the 8½-ton engine does the yard work and hauls ore to the North Side Mill.

The 14-ton engine or No. 1 has been in use since 1901 and has trammed over one million tons of ore each year since installation. Its train is made up of thirty-two 4½-ton cars, each weighing approximately 2½ tons empty, coupled with solid links.

The cost of haulage underground and on the surface has shown a yearly reduction due mainly to improved mining methods and better track maintenance.

For the year 1928 70 percent of the cost of underground haulage has been charged to stoping, 25.5 percent to back-filling and 4.5 percent to development.

* Assistant General Manager, Homestake Gold Mining Company, Lead, S. Dak.



Surface locomotives



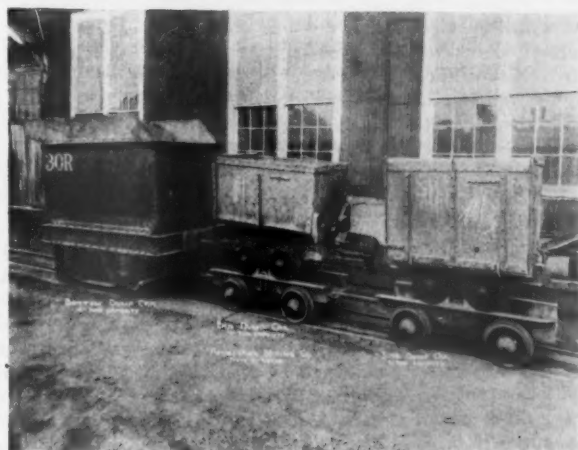
Underground air motors



Underground charging station



Compressed air motor and train



Left, four-ton bottom-dump car; center, one-ton end-dump car; right, one-ton side-dump car



Tram car equipped with springs and roller bearings, built by the Homestake Mining Company

MODERN DRILLING

(From page 363)

expansively in the true sense of the word, by which is implied the act of admitting a fixed volume of compressed air to the cylinder chamber, cutting off the source of supply and allowing the air thus entrapped to expand by virtue of the movement of the hammer piston, and then exhaust itself to the atmosphere at a greatly reduced pressure. One of the reasons why this is not done, in those types of rock drills which employ a valve for controlling the admission of air to and from the hammer cylinder, is because of the danger of freezing at the point of exhaust, which causes the valve to become sluggish in its action and oftentimes causes it to cease functioning altogether by the accumulation of frost. Only in rock drills which do not employ a valve for controlling the exhaust is it practicable to use air expansively by the method described in the foregoing paragraph. In places where labor costs are low in proportion to power costs, it is oftentimes advisable to employ a rock drill in which air is used expansively and especially so under atmospheric conditions where the tendency of the machine to freeze is reduced to a minimum.

The control of the hammer piston in drills equipped with the balanced independent motor rotation may, dependent upon the requirement, consist of either an air-actuated valve or piston-controlled live air supply passages and a piston-controlled exhaust.

UPKEEP COST

The upkeep cost of the drilling machine may be expressed on the basis of cents per ton of rock broken or per foot of hole drilled or per drill shift, depending upon the conditions of the work. At those properties where the drilling conditions vary by virtue of a variation in the character of the ground, the latter method is recommended when making a relative comparison of different makes or kinds of machines, for it is invariably the case that the upkeep cost of a drilling machine when working in an abnormally broken or schist formation, is higher than that of the drill which operates in softer and more uniform ground. Expense caused by breakage and wear of rotation parts, hammer pistons, chuck parts and water tubes, is as a rule the heavy item of rock drill maintenance.

The materials employed in the construction of modern rock drills are the best that it is possible to procure for the respective service to which each is subjected. No expense is spared in the attempt to take full advantage of all available alloys, which are heat treated by the employment of the most advanced methods and facilities obtainable. Absolute interchangeability of every part is

secured by the employment of precision machinery and accurate inspection. It is urged that users of rock drills replace worn or broken parts only with those of the rock drill manufacture, for irreparable damage may result to the machine as a whole by the employment of parts of some other make.

In the modern rock drill all housing parts of the hammer engine, which comprise the cylinder, chuck housing, motor housing, etc., are so made that unusually large abutting surfaces are provided to form the joint between them and all parts are maintained in perfect alignment by dowel bosses of generous proportions. Housed through bolts are employed for securely holding all parts together. This method of construction coupled with the encased and hardened inner wall of the hammer cylinders insures absolute air- and oil-tight joints being maintained and renders the mechanism of the drill practically immune from damage which would normally result from the application of external force.

Structurally, the cylinder walls of modern rock drills are so made that they are practically immune to the blows of a sledge hammer in the hands of an incensed drill operator. The inner bore is hardened, whereas the outer walls are rendered soft, with an intermediate section perforated with drilled holes, all of which perform a definite function, thus providing impact-resisting qualities for the cylinder wall, which render it to all practical purposes "fool proof."

The feed slide employed by the modern rock drill is made detachable from the cylinder, thus providing an effective method for rendering the fit of that part which slides in the ways of the shell or feed cylinder of mounted rock drills being maintained. When these slides wear—which is an unavoidable happening in the presence of rock cuttings to which they are subjected in normal operation—it is but a simple matter to restore them to their original shape by building up with welding, after which they may be machined down to proper size. Such procedure is not practicable with those rock drills wherein the slides are formed integral with the cylinder, chuck housing or back head, as welding would normally distort the piece and cause it to go out of alignment.

The throttle valve employed by the modern rock drill is made from a special alloy to insure against undue wear, and its various operating positions are determined by a non-positive locking device which holds it in any required position against normal vibration.

The chuck parts of the modern rock drill are so made that breakage is but rarely experienced, and the driving lugs of those parts that accommodate the

standard sizes of lugged shank hollow drill steel are hardened clear through to the core, which insures maximum resistance to wear.

Proper lubrication of every working part of the rock drill is essential to successful operation and has a pronounced bearing on upkeep cost. The introduction of oil into the air supply hose by means of the air line lubricator has demonstrated its effectiveness for lubricating the valve mechanism and the hammer piston, but it does not satisfactorily lubricate the chuck parts. The chuck of the modern rock drill is therefore equipped with a grease chamber adapted to be filled with cup grease and of a capacity sufficient for one shift's operation. The cylinder is also equipped with an auxiliary oil reservoir which should, as added insurance, be kept filled with the same grade of oil as that used for the line lubricator. The time-worn adage "Keep all bearings lubricated and all nuts tight" is still the byword of the successful rock drill operator.

CONVENIENCE OF HANDLING

In general it may be said, convenience of handling embraces the size and weight of drilling machines employed, the method of feeding and retracting it to and from its work, the method employed for changing drill steel and in water drills the facilities provided for the removal and replacement of the water tube, the front end of which oftentimes becomes broken off in service and has to be readily replaced underground to avoid the troubles which invariably result from inadequate lubrication of chuck parts when a drill is operated with a broken tube that does not enter the mouth of the drill steel.

The kind and character of the feeding means employed is a determining factor in the ease with which the drilling machine is handled, and regardless of whether it is adapted to be hand-held, mounted with screw feed, mounted with a pneumatic feed, or supported directly by a pneumatic feed for overhead drilling, the feeding means should be given very careful consideration when selecting the most advantageous rock drilling machine for the work.

An exhibit of ore specimens, containing specimens of most of the typical ores and including ore samples from many of the large mines of the world, has been arranged by the Rare Metals and Non-Metals Division of the United States Bureau of Mines, in the corridors of the Bureau's administrative building in Washington, D. C. The arranging of the exhibit has been made possible through the cooperation of the several experiment stations and field offices of the Bureau and the National Museum.

SAFETY WORK

of the CALUMET & ARIZONA MINING COMPANY

WORK at this property begun 13 years ago has paid big dividends—Foremen and bosses are important factors in any safety plan—Bonus system, intensive first-aid training, and individual training of men form an important part of their system

By THOMAS COWPERTHWAIT*

SAFETY work has been carried on by the Calumet and Arizona Mining Company for the past 13 years, and has proven to be a large asset to the company as well as to humanity. Before the safety department was organized, fatalities ranged from 7 to 13 per year, and many very serious accidents occurred causing men to lose the greater part of the year, and some were partially or permanently crippled.

The general class of miners in the days before our safety department was established much exceeded those of today, for they were mostly men of middle age, who had followed mining for several years and actually knew how to handle various underground conditions. Young men were taught by them and soon became efficient miners. Today we are proud to have left a few of these old-time miners, but the majority of the young generation only work long enough to get a road stake and move on to other quarters. They do not become efficient miners for several years, as they do not stop at one place long enough to learn mining methods, and to handle various underground conditions. Many bad accidents occurred even in those days. Safety training has proved to be an asset to the corporation as well as to the worker. With the class of miners we work today our fatalities for the year number 1 or 2, and we have gone as many as 28 months without a fatal accident. We seldom have a serious accident more than a broken finger or toe, which

only causes the injured to lay off a short period.

This proves the value of teaching men the safety habit and, therefore, the value received by the organization from the safety department.

The safety department of the Calumet and Arizona Mining Company was organized February 15, 1915. John C. Greenway was general manager and the writer was appointed safety superintendent of all properties under his management. These included mines at Bisbee, Ariz.; mines and leaching plant at Ajo, Ariz.; smelter at Douglas, Ariz.; and other properties under development.

After a thorough study of conditions and the work assigned to me, and knowing I had the absolute backing of the general manager, I decided that no other inspector was necessary. Being a practical miner and an experienced mining engineer, I was convinced that accident prevention must come about by first teaching the various bosses and foremen, and with their help teach the miners methods of protecting themselves. This was hard and took much time and patience, as many bosses in those days had only one object in view, and that was tonnage. As I have stated, I had the absolute backing of the general manager and, therefore, won after many hard fights.

Our present method of operation is as follows:

The inspector makes a complete inspection of the mines about twice each month, taking a shift boss's run each trip underground. Each shift boss is held responsible for the condition of his

run and for any accidents happening on his run. Nothing is taken up with the foreman nor higher official unless the shift boss is found to be neglectful. This prevents friction between bosses and foremen and tends to create interest rather than trouble. No report is made of conditions unless something has been neglected or is beyond the authority of those in charge and must be remedied by higher officials.

A bonus of \$30 is paid to each shift boss who can work 2,500 man-shifts without having an accident causing a man to lose more than one shift.

A bonus of \$7.50 is paid to each foreman who can go a certain number of days without having an accident causing a man to lay off 14 or more days. The class of work handled by a foreman determines the number of days he must go. At the present time one foreman must work 15 days, another 20 days, and another 30 days.

Each man who goes underground carries his own small first-aid kit. Emergency first-aid kits are also kept at various places underground. We have 12 Gibbs rescue apparatus, and about 20 men are kept familiar with their use.

Three hundred and sixty men received first-aid training during the past year by the U. S. Bureau of Mines. We paid each man who completed this training \$5.

Our system of handling safety work has proven very efficient and not at all expensive. The fact that we have reduced the accident rate 62½ percent since the organization of the safety department shows that safety training is of great value.

* Safety inspector, Calumet & Arizona Mining Company, Warren, Ariz.

MECHANIZED MINING— *the "BIG Question"*

Need for information as to progress being made in mechanized mining under different conditions is an important phase of "the big question" that the National Committee on Mechanized Mining will attempt to meet. A discussion of the value of mechanization

By HUMPHREY D. SMITH *



THE "big question" today usually brought up at most gatherings of coal mining operators is "What are you doing at your mine in the way of mechanized loading?" Meetings are being held in different districts on safety, ventilation, and numerous other subjects of vital interest to the industry, but it is seldom these meetings adjourn without some one bringing up the question of mechanization.

This proves that there is, without a doubt, a large interest being taken by most men in the industry concerning the possibility of introducing in their mines some form of mechanical loading, and before trying this out they seem anxious to know just what the other fellow is doing before making any investment in mechanical loading equipment.

To answer these questions of what the other fellow is doing is the present aim of the American Mining Congress in its new Mechanization Committee, which was recently appointed, with its object being a five-year program on all the different phases of mechanization and to promote efficiency, economy, and safety in the production of coal. Most all mines, due to varying conditions, have a particular problem all of their own to solve when it comes to mechanizing their workings. These conditions start at the face or working place and continue until the coal is loaded in the railroad car.

In West Virginia the coal seams are more changeable from the standpoint of seam thickness, condition of seam as to whether it is clean, contains partings of bone or laminated streaks, or slate or

rock partings, than in most of the other coal-producing states. It is often found that the same seam in one district, as well as in one particular mine, will have wide variations in thickness and impurity content in the way of partings in the seam. These variable conditions have made it necessary for most operators to go very slow in their decisions to adopt any particular type of mechanical loading device.

A particular machine that may be suited to one section of a mine may be too large for another; and again, where one section of a mine may be free of partings and the seam clean and where the loading machine can load coal clean enough for the preparation facilities at the tippie, in another section where rock intrusions come into the seam it might be impossible for this loading machine to load coal clean enough whereby it could be properly prepared at the tippie, and if not a loss of business would result. Not only is it necessary to study the proper machine from a preparation standpoint, but roof conditions play a large part in the proper selection of a loading machine.

If the roof is a soft, friable draw slate, which comes down with the coal when shot at the face, a loading machine would load this out with the coal or hand removal of this would be necessary before the loading machine went into the face to load the coal. It might be possible to timber this friable draw slate and hold it up until the coal was loaded out, but the timbers being so thick would make it impossible to operate the loading machine economically. In this case conveyors might be advisable.

If the coal contained partings of im-

purities which would make it uneconomical to be all loaded out with the coal, then again conveyor loading might be the correct solution for this condition instead of the loading machine.

The question of proper shooting the coal and the degradation in loading, causing an increase or decrease in the percentage of lump sizes, would also govern the type of equipment to be used. Where a machine might be satisfactory on a hard, firm, blocky coal, it might be unprofitable in a soft, friable coal.

These and many other reasons are the determining factors as to whether a mine can go to mechanical loading of its coal, and only by close cooperation in the industry and the dissemination of information concerning these factors can facts be given out which will help solve the "big question" of "What are you doing at your mine in the way of mechanical loading?" and give other interested operators in the industry a chance to help solve their particular problem.

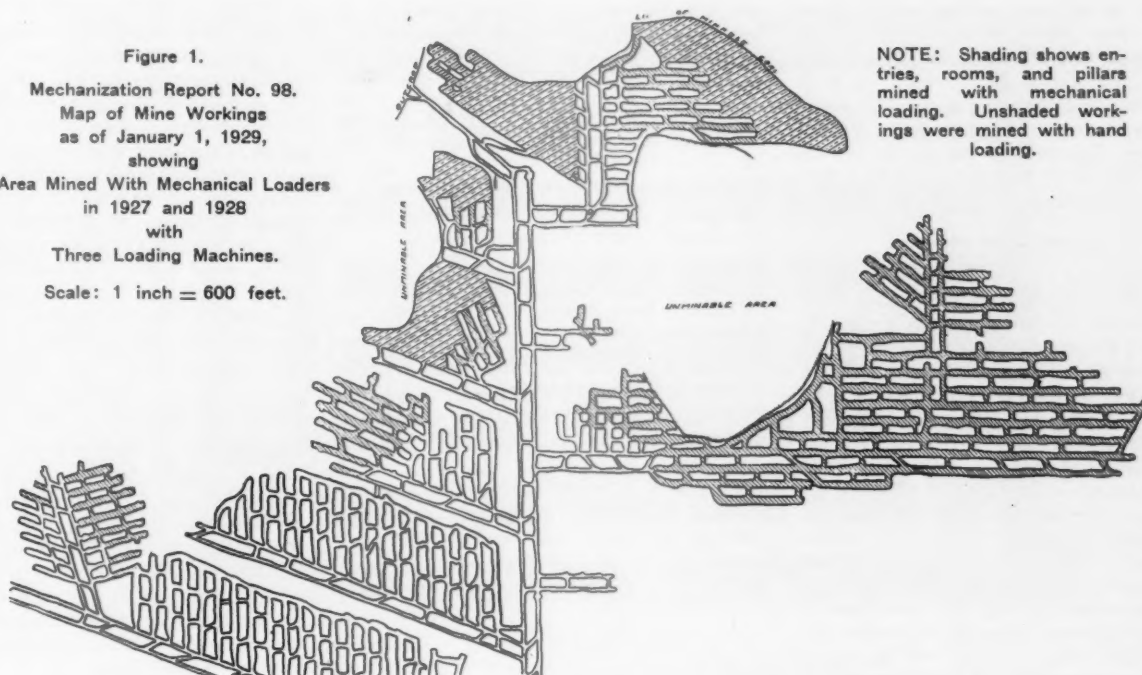
The National Committee on Mechanized Mining sponsored by the American Mining Congress will try to collect, with the cooperation of the mines in the industry who are using or attempting to use mechanical equipment, data which can be compiled in such form to help answer the "big question."

New methods of transportation may have to be worked out in a mine to make mechanical loading profitable, and also new methods of cleaning and preparing the coal at the tippie will be necessary in some cases.

During the past few years many new devices have been put on the market to prepare coal at the tipples in the way of wet washing (Continued on page 380)

* Assistant to the President, Pemberton Coal & Coke Company, Ashland Coal & Coke Company, and Majestic Collieries Company, Bluefield, W. Va.

Figure 1.
Mechanization Report No. 98.
Map of Mine Workings
as of January 1, 1929,
showing
Area Mined With Mechanical Loaders
in 1927 and 1928
with
Three Loading Machines.
Scale: 1 inch = 600 feet.



NOTE: Shading shows entries, rooms, and pillars mined with mechanical loading. Unshaded workings were mined with hand loading.

MECHANIZATION REPORT NO. 98

By G. B. SOUTHWARD

MECHANICAL LOADING IN ENTRIES, ROOMS and PILLARS

THE mine covered by this report has been using mechanical loaders for about three years, in a seam of coal ranging from $5\frac{1}{2}$ to 9 ft. in height. During the first year the loading was to some extent experimental but for the last two years the machines have been on an operating basis. Three mechanical loaders are in use and the mine is now two-thirds mechanized with one-third of the output still produced by hand loading. The map in figure 1 shows the area which has been mined during the last two years with the loading machines. This has consisted largely of room advancement, but some entry driving and pillar recovery has also been done.

A considerable portion of this mining has been in panels which were started by hand loading and in these sections there was no change made from the hand mining projection which worked rooms 300 ft. long at right angles to the panel entries. It was the opinion of the management, however, that short room lengths were not particularly well suited to the requirements of mechanical loading and that a better mining system could be designed by driving a comparatively small number of rooms continuously to lengths of 1,000 ft. or more. In this plan a series of 6 or 8 rooms are advanced abreast as an operating unit.

At intervals of 400 or 500 ft. a line of breakthroughs is projected across all the rooms to form a cut-off haulway leading back to the first room of the series which serves as a haulway for the panel. This plan is shown in figure 2 and it will be seen that its effect is to drive the rooms parallel to the direction of the panel development instead of at right angles as is the usual practice in hand mining.

This method was started in the first panel to the right off the main headings as shown on the map in figure 1, but some low coal and barren areas in this section prevented the regular development of the projected plan. The map shows that the idea has been followed as closely as the underground conditions would permit and the management reports that they believe this system will prove more advantageous for their mechanical loading than the short room length panels formerly used in hand loading.

The pillar work which has been done with the loading machines as shown on

the map has been near the outcrop where the cover was light. The plan of recovery is by cross-cuts or pockets as illustrated in figure 3. This method does not attempt to mine 100 percent of the coal as a small pillar is left next to the gob line which serves to hold the working places open while the coal is being mined. The small percentage of loss is not a serious factor and the management considers that their pillar recovery with loading machines has been successful.

After the first year of operation the mining practices were fairly well standardized and there have been no major changes in the methods since that time. Some improvements, however, have been made. In the earlier operation all gathering was done by animal haulage, two drivers serving the machines with a gathering driver for delivering small trips to the main line sidetrack. An electric locomotive has now been installed to replace the third driver and this locomotive hauls between the main line sidetrack and a storage track near the working rooms. This has not decreased the number of men employed but has eliminated the necessity of maintaining a main line sidetrack in close proximity to the working places.

Another improvement has been in the reduction of the men employed at the

loading machine. The earlier operation used—in addition to the machine operator—two men at the loading end. One of these has been eliminated and only one man is now employed at the head end to pick down hanging coal and shovel loose coal out of the corners of the rooms. This reduces the regular operating crew to 10 men where 11 were formerly employed.

PRODUCTION RECORDS

The production figures which are given in Table 1 cover the three months from December 1, 1928, through February, 1929. The average production from the loading machines during this period was 825 tons per day which was mined by three mechanical loaders—one working on single shift and the other two for the most part on double shift. The average tonnage made by each machine can not be given as figures are not available to show the total number of shifts worked by each loader. It is reported by the management that under normal conditions a machine unit will load approximately 200 tons when driving rooms on day shift. This average will be somewhat reduced when the machines are on pillar recovery or working on night shift.

The figures given in the accompanying table show that the mine operated 86 days with an average production of 1,254 tons per day. A total of 136 men were employed in both machine and hand loading—including all operations inside and on the surface. This gives an average production of 9.2 tons per man shift for all men employed. The two methods of mining are carried on separately from the face to the main line haulage and the following analysis is submitted to show a rough comparison between the results of hand and mechanized loading.

The mechanical loading produced two-thirds of the total output with an average of 825 tons per day and employed 52 men from the face to the main line haulage. This figures an average of 16 tons per man-shift for the cutting, loading and gathering. If we assume that the entire production of 1,254 tons per day from the mine had been loaded with machines at this same rate of 16 tons per man, and assume further that the present force of 39 men for the general inside and surface had remained unchanged, then the production for a 100 percent mechanized loading operation, including all men from the working face to the railroad cars, would have been 10.7 tons per man.

During this period hand loading gave a production of 9.5 tons per man for the operations from the face to the main line haulage and mined one-third of the total output. If we assume again that the entire output had been loaded by hand at this same rate, and that the rates in the

general operations had also remained constant, then the mine on a 100 percent hand loading basis would figure a production of 7.3 tons per man for all men employed.

TABLE I

Showing Production Record and Men Employed During December, 1928, January and February, 1929

Total days worked.....	86
Tonnage by mech. loading.....	70,921
Tonnage by hand loading.....	36,964
Total tonnage mined.....	107,885
Average daily loading by machines.....	825
Average daily loading by hand..	429
Average total daily tonnage....	1,254

MEN EMPLOYED

Face Preparatory

Mechanical loaders (825 tons per day)	Hand loading (429 tons per day)
Cutters 5	Cutters 6
Drillers 5	Drillers 2
Shot firers 3	

Loading

Loading machine crews.. 15	Hand loaders.. 28
Electricians and mechanics .. 2	

Gathering

Motormen 4	
Drivers 13	Drivers 6
Trackmen 5	Trackmen 3

Total mech. loading .. 52	Total hand loading .. 45
---------------------------	--------------------------

GENERAL OPERATION

(For machine and hand loading)
(1,254 tons per day)

Underground

Main haulage operation.....	4
Haulage maintenance	2
Electricians and mechanics.....	2
Timber, ventilation, drainage.....	4

Surface

Tipple operation	12
Slate pickers	6
Blacksmiths	2
Stableman	1
Watchman	1

Supervision

Superintendent	1
Master mechanic	1
Mine foreman	1
Tipple foreman	1
Fire boss	1

Total general inside, surface and supervision	39
---	----

SUMMARY

Mechanical loading	52
Hand loading	45
General	39

Total men employed.....	136
-------------------------	-----

It will, of course, be understood that the above figures are theoretical in that they deal with a situation which does not actually exist. In other words the mine is not 100 percent mechanized and we can only assume what would take place if it were. However, these figures are interesting in that they indicate that the change from an all-hand loading to an all-machine loading basis would increase the tonnage per man employed from 7.3 to 10.7—a 50 percent increase in the production from all labor. Without submitting any definite figures the management reports that the mechanical loaders have effected marked savings over their hand mining costs.

OPERATING REPORT

PHYSICAL CONDITIONS

The seam averages from 5½ to 9 ft. in height. The coal is of tough structure and is free from any regular parting. The top is a sandy shale which stands in the headings and rooms without timbering. Sandstone bottom. The seam pitches about 7 percent and has a cover varying from outcrop to 800 ft. Closed lights. Rock dusting.

MINING SYSTEM

The mining system is room-and-pillar advancing with mechanical loading in the entries, rooms and pillars. In the older panels which had been started by hand mining a pair of entries 22 ft. wide were driven to the raise with rooms 28 ft. wide and 300 ft. long on 60-ft. centers turned off one side of the entries. In these panels there was no change made from the hand mining projection except that the width of the entries was increased. In the more recent work a departure from the hand mining plan has been made as shown in figure 2. Rooms are now 1,000 ft. or more long with a line of breakthroughs driven across the rooms at intervals of about 500 ft. so as to form a cut-off haulway. This line of breakthroughs is equivalent to a single entry which shortens the length of the gathering haul. From 6 to 8 rooms are taken as an operating unit for one loading machine and are advanced abreast.

The pillars are mined retreating with the loading machines. In the present method cross cuts 30 ft. wide are driven through the pillar at approximately right angles to the room. A thin pillar from 6 to 8 ft. thick is left next to the gobb line and usually the cross cut does not penetrate entirely through the pillar. These thin ribs of coal have been found very effective in maintaining the roof over the working places while the coal was being recovered. The general method is shown in figure 3.

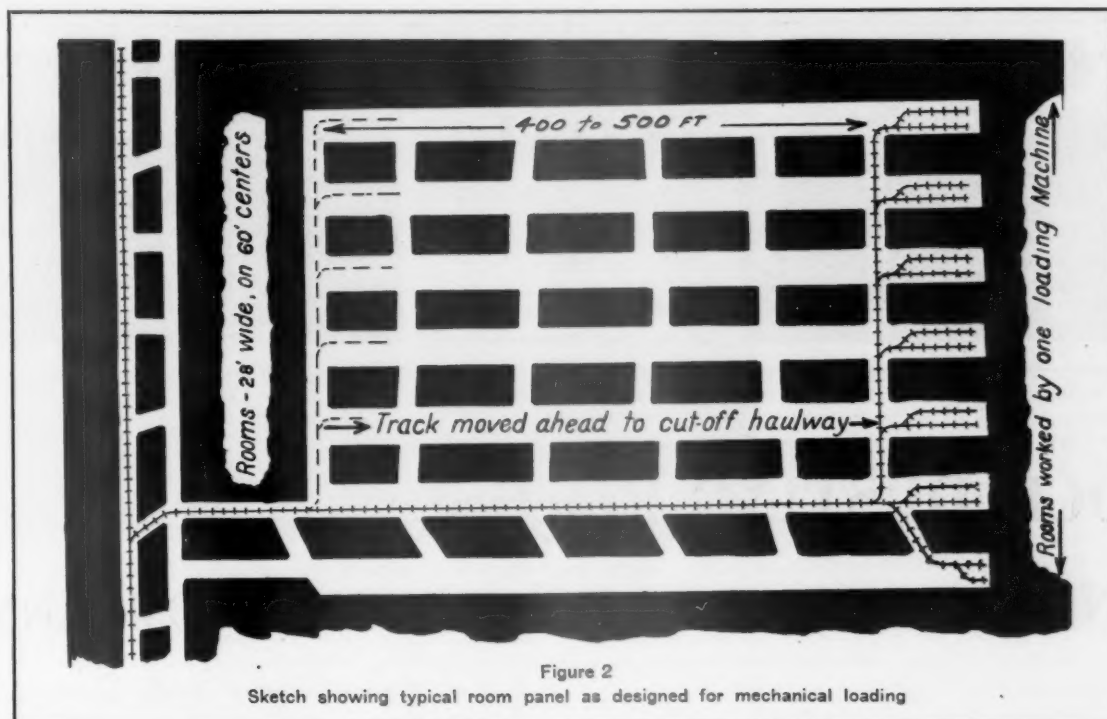


Figure 2
Sketch showing typical room panel as designed for mechanical loading

MECHANICAL OPERATION

One loading machine is used in a panel driving the rooms and advancing the entries. The loading is worked on either single or double shift with the cutting, drilling, track work and other operations on the same shift with the loading. The machine is mounted on caterpillars and travels from one room to another through the breakthroughs. The machine loads directly into mine cars of four ton capacity which are placed one

at a time by mule and driver. Each room has a double track of 20-lb. steel on 42-in. gauge and while the machine loads into a car on one track an empty car is being placed on the other. This eliminates delays incidental to car placing. Two drivers serve each machine and haul to a side track near the room neck and a gathering locomotive deliveries trip to the main line sidetrack.

All coal is machine undercut with a 6½-ft. bar and is shot with permissible

explosive and electric firing. Ten shots, each shot using from one and one-half to two sticks of powder, are fired in a room 28 ft. wide. These are placed in two rows, five bottom and five top, and by means of delayed fuses the bottom shots are fired first so as to give a snubbing effect. As the machine is capable of digging to some extent and can handle very large lumps, the intention here is not to break the coal unnecessarily in the shooting.

OPERATING CREW

All work of cutting, drilling and loading is done during the same shift of eight hours. Each machine operation has a regular shift crew of 10 men; consisting of 1 machine operator, 1 shovel man who helps break large lumps and clean out the corners of the rooms, 1 car trimmer, 2 drivers, 1 motorman, 2 cutting machine men who also do the drilling, 1 trackman, and 1 shot loader. Each room cut produces about 55 tons of coal and 4 rooms are usually loaded out during a shift.

EQUIPMENT

Each operating unit uses 1 loading machine, 1 cutting machine, 1 electric drill, 1 electric gathering locomotive and 2 horses.

PREPARATION

As the coal does not have any regular parting there is no slate picking at this operation either inside or outside the mine. The method of shooting the faces produces large lumps of coal and the management reports that the sizes from the machine loading compare favorably with that produced by hand mining.

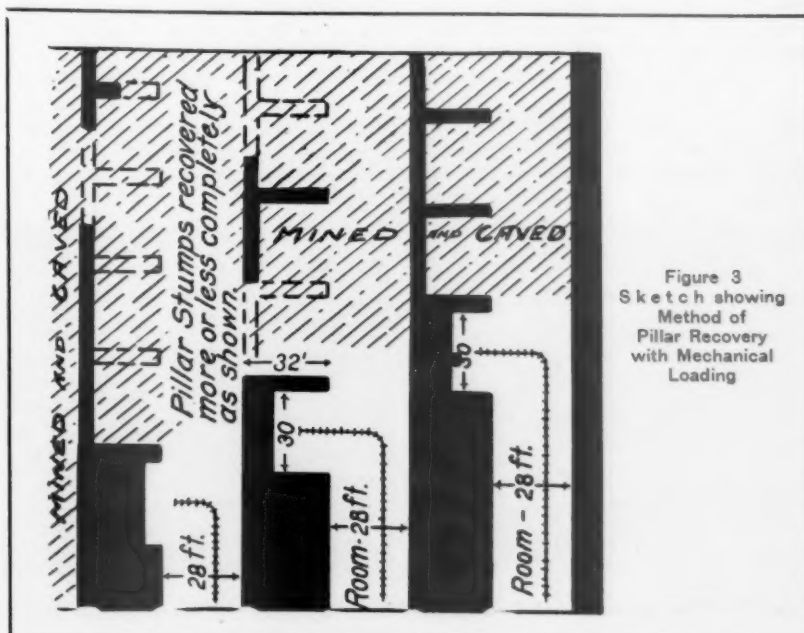


Figure 3
Sketch showing
Method of
Pillar Recovery
with Mechanical
Loading

PRACTICAL OPERATING MEN'S DEPARTMENT

COAL

NEWELL G. ALFORD

Editor



*Practical Operating Problems
of the Coal Mining Industry*



ROCK DUSTING Practice

at NEMACOLIN MINE, BUCKEYE COAL COMPANY

Rock dusting program rapidly approaches completion—7,000 tons of dust used since 1924—Program includes the dusting of each excavation in the mine, air courses, rooms, development entries, and haulage ways—Methods of rock dusting summarized—Modern equipment of both high and low pressure type in use

By W. H. GATES* and GORDON MACVEAN†

THE question of how to properly rock dust a bituminous coal mine is one which has engaged the attention of every well-informed and forward-looking bituminous coal operator. Companies carrying compensation insurance on coal mines have shown little

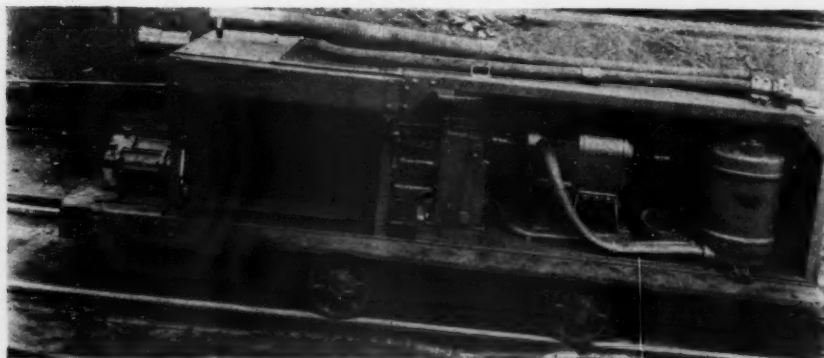
hesitancy in making their requirements rather strict relative to how complete the dusting of a mine should be before credit for taking care of the coal dust hazard could be issued. At the time that this article is being written, two of our largest coal producing states, Pennsylvania and West Virginia, have bills before their respective state legislatures which, if passed, will give the mine inspection departments power to enforce

the use of rock dust in those mines where it is thought that the hazard of a coal dust explosion exists.

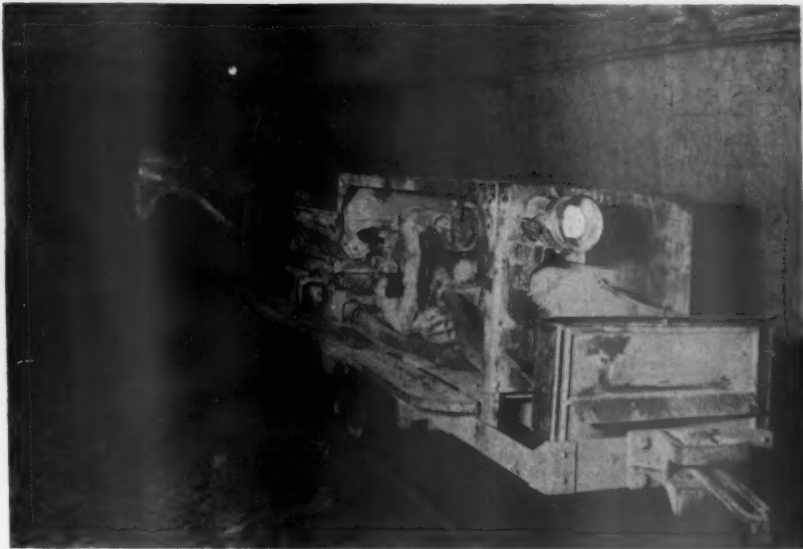
The Buckeye Coal Company is a firm believer in rock dusting. Rock dusting practice at their Nemacolin mine is evidence of it. This company has always been interested in the latest developments in this practice and has endeavored to keep abreast of the times, in fact, somewhat ahead. It has recog-

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† Asst. Sales Manager, Mine Safety Appliances Company, Pittsburgh, Pa.



Two views of the high pressure rock dusting machine



High capacity machine for dusting track entries and rooms

nized that the hazard of coal dust explosion is certainly a definite one and one with which it was a paying proposition to cope. Rock dusting represents life and property insurance on which the premium is absurdly small.

The Nemacolin mine of the Buckeye Coal Company is located at Nemacolin, in Greene County, Pa., along the banks of the Monongahela River. It is owned and operated by the Youngstown Sheet & Tube Company, of Youngstown, Ohio, to whom all of its coal is shipped. Its daily production now averages 6,600 tons, about 1,000 men being employed inside and outside. It operates in the Pittsburgh No. 8 seam, having an average analysis of 34.44 volatile and 56.40 fixed carbon. Its coal dust is therefore recognized as explosive and the mine is classed as a gaseous mine.

The practice of rock dusting was commenced in 1924, since which time approx-

imately 7,000 tons of rock dust have been used. This seems like a large amount of rock dust, particularly inasmuch as the mine is comparatively young. The first shafts and slope reached the coal in 1918 when the production of coal was started.

The problem of rock dusting the Nemacolin mine was a serious one. It was recognized that to properly rock dust the mine every excavation should be covered with a reasonable thickness of dust. The mine layout, which was designed for efficiency in haulage and ventilation, was, in a large measure, responsible for the rock dusting problem. Room and pillar methods are used, rooms being 300 feet long, 12 feet wide on 100 foot centers. Fourteen main entries are driven away from the shaft bottom and these continue to the development entries in virgin coal. Five pairs of entries on the flats are taken off the haulage entries at 1,400 foot intervals. Butt

entries are on 300 foot centers. The magnitude of the rock dusting problem can well be appreciated when the total length of entry to be dusted is computed. The 14 development entries are now two miles away from the shaft bottom. Last year nearly 20 miles of development entry were driven. The actively worked rooms at present number approximately 200.

In 1925 a coal mine was considered well dusted when the haulage entries from the shaft bottom to the last breakthrough in the development entry were covered. Occasionally a mine could be found where a considerable investment had been made in the erection of trough barriers in the air courses. Barriers of various designs were in use, none of which was approved by the Bureau of Mines. Through the past four or five years, the untiring efforts of the men in charge of the experimental mine of the United States Bureau of Mines at Bruce-ton have brought certain facts to light regarding the proper methods of rock dusting. These may be summed up as follows:

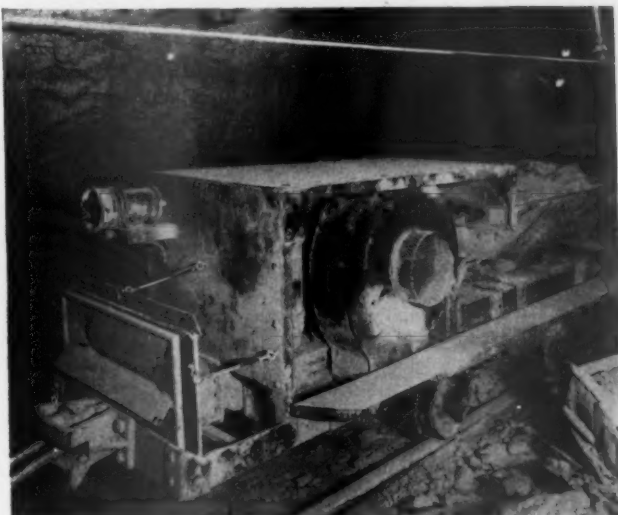
1. That there is enough dust present in every bituminous coal mine to make possible a coal dust explosion, the relative explosibility of the coal dust being mainly dependent upon the fineness, dryness, and volatile content of the coal dust. The low volatile coals are not as sensitive to ignition as the high volatile coals, but they propagate an explosion with considerably more violence.

2. The possibility of the propagation of a coal dust explosion is greatly influenced by the following factors:

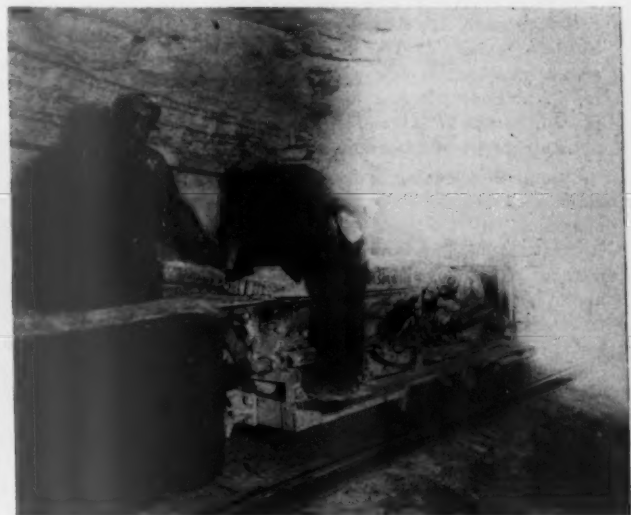
- (a) The presence of gas in the air current.

- (b) The position or distribution of the coal dust along the entry as to its location on the floor, ribs and roof.

- (c) The strength of the source of ignition. (Continued on page 382)



The machine charged ready for service



Rock dusting machine in action

AERIAL TRAMWAYS

Serving Two Coal Cleaning Plants of the PITTSBURGH COAL COMPANY

By FRED C. CARSTARPHEN *

THE Pittsburgh Coal Company has at this time two heavy-duty aerial tramways serving its Champion cleaning plants Nos. 4 and 5, and is building two more, having in all a capacity per year of about 10,000,000 tons. The company has, therefore, provided a way to prepare at least half of its production in accordance with customers' specifications. Coals of exceptional quality can now be supplied continuously to the trade for domestic, steam, gas and metallurgical uses, although the origin of the coals may be mines of variable output and grade.

In effect, coal is no longer just coal, but a standardized product, and unprepared coals will soon cease to be a serious factor in the market. The economies resulting to the purchaser from the use of prepared coals are far greater than the increased cost. While all prepared coals are good, some are better than others, depending upon the method of preparation. As an illustration of the variety of method, such as dry and wet, the following brief description is given of the Pittsburgh Coal Company's plants.

CHAMPION Cleaning Plant No. 3, located at Library, Pa., uses air separation through Arms Tables, as installed by Roberts and Schaefer in 1926. Using an average feed of minus 2½ in. at 425 tons per hour of coal containing 12.1 percent of ash before cleaning results in an ash content of 7 percent or less.

Champion Cleaning Plant No. 1, located at Champion, Pa., was placed in operation in 1928, and uses Koppers-Rheolaveur counter flow regulated launders for water, together with centrifugal and other driers, a tippie, and auxiliaries, treating 700 tons per hour of minus 4-in. heads, varying from 12-16 percent ash, gives a finished product as low as 5 percent and negligible sulphur.

Both air and water separation methods utilize the difference in specific

THIS paper aims to present, briefly, some of the elements of a problem of intermine transportation that the Pittsburgh Coal Company solved by building two heavy-duty aerial tramways. In this the way is prepared for a later discussion (which will appear in a subsequent issue of this Journal) of the operating data secured and the conclusions reached concerning their adaptability to the needs of the conditions.

gravity of coal as compared with slate, being about 1.38 and 2.6, respectively. The economical working value is frequently found to be 1.6; that is to say, the waste products are those having a specific gravity higher than this figure.

The other washeries now coming into production are Champion No. 4, located at the Warden mine, near Douglas, Pa., and Champion No. 5, located near Banning, Pa., both being in the celebrated Youghiogeny coal field to the south and east of Pittsburgh, but separated by about 15 miles, the Banning plant being the more distant. Both of these use the Koppers-Rheolaveur system.

The location of these plants was influenced by several factors. The Montour Railroad brings coal from five, or more, different mines to Champion No. 1, but was not available for the others.

THE Warden mine is one of the premier coal mines in America, but, even so, it is desirable to blend its product for certain markets with coal from the Ocean mine a mile away. Likewise coal from Banning No. 2 mine is sometimes mixed with that from Banning No. 1. It was important to select an economical and dependable method of transportation between the mines in question. Minus 4-in. coal, from the shaking screens and picking tables, was involved.

Physical difficulties and high costs prevented connecting these mines underground. Surface haulage was not attractive because of the roughness of the intervening topography. Strange to say, a straight line between the mines fell in the channel of the Youghiogeny River. In spite of the angle in align-

ment due to this, aerial tramways were selected for transporting the coal. They not only offered the most economical service, but also permitted the dumping of washery refuse along the location.

AERIAL tramways offer many advantages, among which may be mentioned freedom from interferences, such as snow and ice, and great economy in power consumed, since they operate in balance and utilize the economies of transmitting power by rope.

These advantages had to be weighed against the belief that prevails in some quarters that aerial tramways are light and flimsy contraptions that are sometimes advocated as an outlet for a certain class of products. It is sometimes difficult to study the transportation problem to the end that structures and equipment will be best adapted to the service.

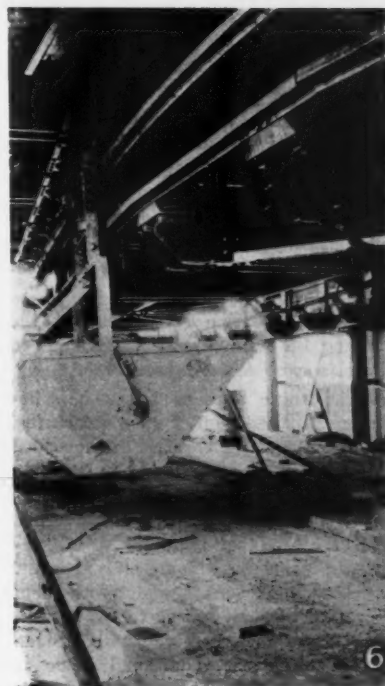
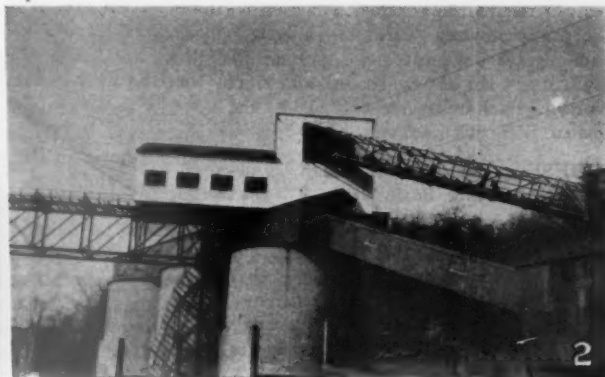
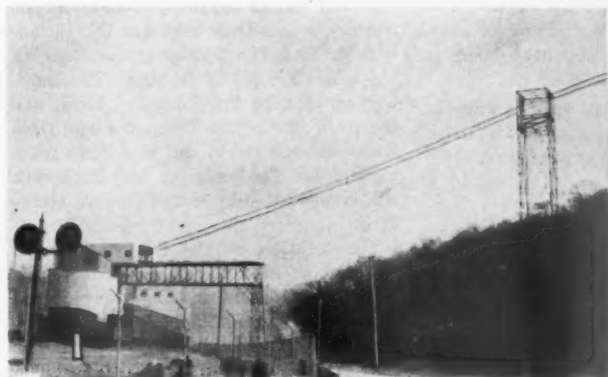
It is well known that aerial tramways are flexible and economical in operation, and it was determined to use them at these plants, and to build sufficiently strong to attain the expected service.

Continuous double cable aerial tramways were selected; that is, stationary track cables supporting the carriers that are hauled by a moving traction rope.

Plans and profiles of the site, and general specifications covering the main elements of the system, were prepared and submitted to the leading aerial tramway manufacturers. After a careful scrutiny of their proposals, the Pittsburgh Coal Company determined the equipment offered to be inadequate to its needs, and the engineering department was instructed to design and erect the tramways. This decision took into account that less than 15 percent of the equipment needed was unique, and that all the rest could be obtained by the purchasing department in the regular way.

Accordingly, designs were prepared of the grips, carriers, machinery stations, and cable supports, and all purchased on competitive bids. Although much more sturdy, and better adapted to the use intended, all of this equipment was

* Consulting engineer, Denver, Colo. Member American Institute of Mining and Metallurgical Engineers; American Society of Civil Engineers.



*Some Illustrations
of
Pittsburgh Coal's
aerial tramway system*

- (1) *The discharge terminal truss, bins, tipple tracks and tower No. 16 of the Ocean-Warden tramway.*
- (2) *The Ocean-Warden terminal, showing the several decks of the system. Waste disposal conveyor, tramway discharge terminal, coal distributing conveyor, storage bins, and coal conveyor to washery.*
- (3) *The Champion No. 4 Washery, located at the Warden Mine.*
- (4) *Exterior view of the angle station.*
- (5) *The tension tower and drive house.*
- (6) *A carrier in the angle station.*

secured at prices that showed a substantial saving when compared with the proposals received.

As a result, the conclusion is reached that any company possessing a competent engineering staff and a purchasing department can design, secure, and erect its own aerial tramways at a profit, and operate them with economy.

THESE aerial tramways may be described, briefly, as follows:

At the Ocean and Banning No. 2 mines, respectively, steel bins of 1,500 tons capacity insure a continuous supply of coal to the tramway, although mine haulage or tippie operation may be temporarily suspended. If necessary, this storage is ample to provide for excess mine production during the day shift, and the tramway can move it at night.

The tramways are rated at 125 tons per hour capacity, but are subject to variation as desired. Reciprocating plate feeders fill the 36 cu. ft. buckets of the tramway carriers. These buckets are self-dumping and self-righting and have a minimum surface for a maximum volume, and discharge the contents with little, if any, sideways. When used with the aerial trippers, these buckets drop their load at any desired point. Accordingly these tramways carry coal in one direction and waste washery refuse in the other. In anticipation that this refuse may amount to 18,000,000 tons during the life of the operation, steel supports having an average height of 107 ft. were used. The highest tower, No. 5 of the Ocean-Warden line, is 165 ft. high, and is a combination tramway and high-voltage transmission line support.

The length of the Ocean-Warden line is about 6,200 ft., and traverses a summit 400 ft. higher than the loading terminal.

Here is located the angle station that automatically accommodates the moving carrier to a 48 degree change in direction of travel.

A similar station is required by the Banning 1-2 tramway, but the change in direction exceeds 53 degrees.

These angle stations are a new departure in the design of such structures. The hangers of the carriers are equipped with rollers that in turn engage suitable rails that enable the hanger to pass between the traction rope and its guide sheaves. All other tramways using underhung grips have found it expedient to detach the carriers and allow them to coast around the curve to the attachers. Since this system can not be made reliably automatic, additional labor is required in the operation of such stations.

The carriages are equipped with four

wheels, and were designed to carry a 5,000-lb. load. When tested, they passed this weight without distress. The grips are of the trunnion type, 8 in. in diameter and have a holding power of more than 1,800 lbs. when the back lever is closed with a pressure of 60 lbs.

The speed of the tramways is slightly more than 500 ft. per minute. The drive consists of a combined grip sheave, master gear and brake drum, all driven by a 75-hp. slip-ring motor, through a heringbone speed reducer. The brake may be applied by hand, but is designed for automatic operation, being set by a suitable motor, acting through a worm gear. This method is superior to solenoid brakes, which often act too quickly for the good of the line. The operating cycle is full speed ahead, or half speed ahead or reverse, and is remotely controlled by push-button stations and magnetic contactors. The panel is so arranged that the brake motor is started in release as the main motor swings into motion, and the reverse operation is carried out when the current to the main motor is cut off. The manual operation of the brake takes place if the power suddenly fails.

THE discharge terminal of the Ocean-Warden line could not be accommodated in its entirety upon the circular storage bins of the washery, and so it rests partly upon the bin, and a combination bridge and guard for the tippie tracks and a state highway. The hopper into which the tramway buckets discharge is more than 80 ft. above the ground. For this reason, the cable anchorage and drive foundation were combined in a single block of concrete, located on the side hill to the rear of the terminal.

The track cables are 1¼-in. diameter lock coil construction, anchored at each end, thus eliminating the use of weight boxes and all of the troubles incidental thereto. The use of anchored spans promotes longer life of track cables than weight boxes and permits keeping the position of the track cables within narrow limits between loaded and unloaded conditions. The traction rope is ¾-in. diameter, plow steel lang lay construction. All of the important sheaves are 6 ft. in diameter, and the tramway is equipped throughout with Timken roller bearings.

The station rails are graded, so that the carriers move to loaders and attachers with a minimum of effort on the part of the crew. The carriers attain the speed of the traction rope before the grip takes hold, thus eliminating jerks and other disturbances.

THE Banning 1-2 aerial tramway is 6,550 ft. long, and is equipped similarly to the Ocean-Warden line. Since the volume of washery refuse to be wasted is less than that for the Ocean-Warden line, the towers of the Banning tramways are but 72 ft. high. The tramway crosses the Youghiogheny River and the main line of the Baltimore and Ohio Railroad each twice, and also three main highways. The railroad and highways will be protected by suitable guard structures.

The location of the tramway circles the town of Banning, Pa., and the entire line is visible to an observer located across the river. The angle station is located upon a knoll 140 ft. high, the greatest eminence along the line. The principal construction problems connected with this line have to do with the several crossings rather than topography. Forty horsepower will be sufficient for this tramway.

These tramways are designed for service, and the years to come will demonstrate whether this aim was attained, and if not, why not. With ever-increasing costs and freight rates in this country, the admirable qualities of aerial tramways for transportation will receive increasing recognition until they surpass the favor accorded them abroad.

TOP CUTTING TENDS TO PREVENT FALLS OF ROOF AND COAL

Coal mining engineers attached to the Pittsburgh, Pa., experiment station of the United States Bureau of Mines, in making a study of mine roof conditions and mining methods as they affect accidents from falls of roof and coal, have the opportunity to observe many practices which are in the interest of safety.

Among these may be mentioned the practice of using top cutting machines which make the cut in the coal at or near the top of the bed. The use of explosives in blasting the coal that is top cut does not affect the immediate roof as is the case where the coal is undercut near the bottom. Where the coal is of sufficient height, the top cut is often made a foot or more below the roof and in this case the head coal remains as protection and support to the overlying draw slate or shaly roof material. This head coal is mostly recovered in the final mining. In a number of mines visited it is the practice to top cut and shear in the center. Where this is practiced it is reported that there is a pronounced increase in the percentage of lump coal produced; less explosive is required and a safer roof is maintained, in narrow places requiring only an occasional permanent timber and in wide places requiring much less timber than in similar places where the coal is only undercut before blasting.

Mechanized Mining on LONG WALL FACES

Roof action most vital question—Using scrapers on a 4-ft. seam of coal—Method of roof control with conveyor mining practice—Success or failure of longwall faces depend upon knowledge and judgment of those in charge in conforming to requirements of natural conditions

By WALTER B. DALRYMPLE *

COAL-MINE mechanization in its recent growth has followed the line of development characteristic of American industry in its effort to perform with greater safety, greater economy, and consequently with increased efficiency. This development has required changes in our mining methods and a concentration of working faces, and it needs little imagination to realize the economy in labor and material which results by grouping or consolidating the mine workings into a few sections served by one main haulageway. With the standardization made possible by loading and conveying machinery we may expect further improvements from such a program.

To my mind, the item of greatest importance in coal-mine mechanization as applied to working long open faces is not the type of equipment, the cycle of operations, or the concentration of the work. The most vital question is to know or determine the natural action of the roof as it affects or is affected by the operation. I have found from personal observation that in working pillars, by the room and pillar system where a long fracture line is used, the roof action can be anticipated. Where warning is given which indicates the action, it is reasonable to say that the roof can be handled, but this may restrict the operation to some special type of conveying or loading equipment. However, in determining what the characteristic roof action will be, the information thus obtained should be recognized and used as an impartial guide when selecting the type of equipment and when planning the methods of operation.

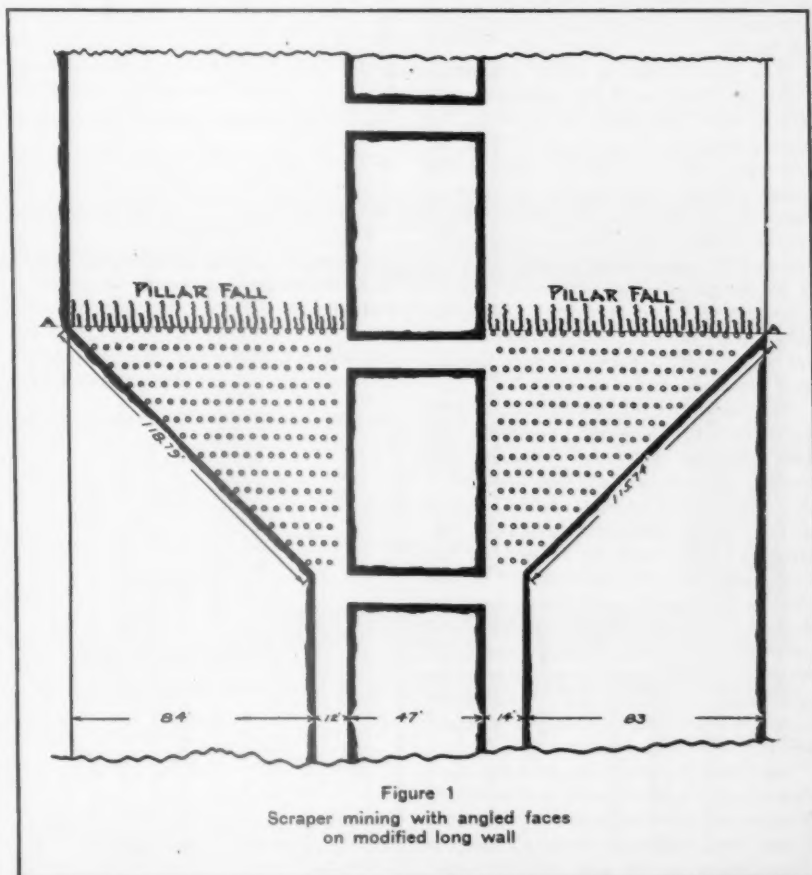
In making the above statement relative to the value of recognizing or determining the characteristic roof action I do not mean to say that an empirical formula can be derived. The top in

every mine has its own individual characteristics. These must be recognized, and the result of a method for controlling the roof will depend entirely upon the ingenuity and practical knowledge of those directly in charge of the operation.

I am submitting two illustrations of mining systems which are founded upon practice and are operating successfully at the present time. Although these plans are different in outward appear-

ance, they are fundamentally the same in principle. These are based on the theory that the pillar face, to be handled successfully, must be kept in a regular line, and that the roof support must be not as you would like to have it but must conform to the natural physical conditions as they exist.

The illustration in figure 1 shows a long-face operation using scrapers in a 4-ft. seam of coal. A pair of entries on 60-ft. centers are driven 12 and 14 ft.



* The New River Company, Macdonald, W. Va.

wide with faces worked retreating and turned at 45 degrees to the right and left off the entries. Both entries are brushed for headroom, but no top or bottom is taken on the faces. The entry brushing is gobbled against the chain pillar, and this chain pillar is not recovered. The faces retreat on symmetrical lines with the timbering on 4-ft. centers set parallel to the face. The roof action in this operation has been reasonably safe and successful. Several times the faces have been closed by falls, but, due to the type of equipment and the mine plan, these have been quickly reopened.

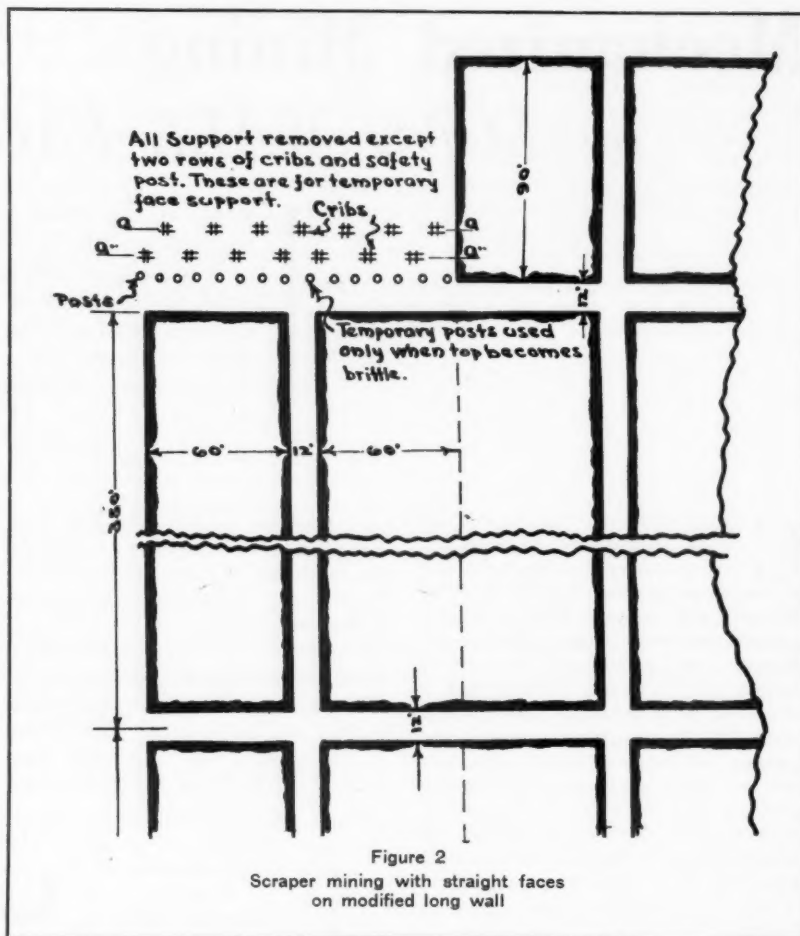
The successful roof action has been primarily due to the natural lines of fracture of the overlying sandstone strata, which varies from 10 to 80 ft. in thickness. Had the angle of the faces been changed to 90 degrees or 30 degrees from the entry, I am convinced that the system would have failed. Too much weight would be acting normal to the face of the coal.

In this method the timbers should be set in line at right angles to the entry. In each row the direction of the cap pieces should alternate so as to partially overcome any tendency of the top to ride. (See figure 2.) The timbers should be not over 8 or 10 in. in diameter, and if possible should be removed beyond the natural line of fracture (marked AA) in figure 1.

The plan shown in figure 3 shows a pair of faces at right angles to the entry; each face being 60 ft. long. The face conveyors discharge to a haulway conveyor laid in a single entry. The seam of coal is practically the same as described in figure 1, but the overlying strata is quite different. The immediate top varies from a smooth sandstone from 3 to 20 ft. thick to a brittle, coarse, granular sandstone carrying considerable lime. The latter, when exposed to air for any length of time, will take weight, and requires extra timbering.

The operation of this system follows ordinary conveyor mining practices, but the principle difference between this method and the one described in figure 1 is in the method of roof control. There is no partial protection given to the straight faces, such as is had in the angled faces by the chain pillars or the support of the coal, and the roof action in figure 3 is dependent entirely upon timbering or some form of artificial support. Several such pairs of faces can be worked simultaneously in adjoining panels if separated by a proper interval which is determined by practice.

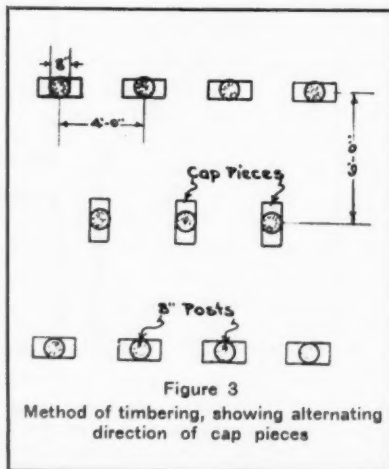
The timbering used along the face consists of one line of timbers and two rows of cribs, as shown in figure 3. At times it has been necessary to vary these by removing one of the crib rows in order



to get a fall, or by strengthening the timber line next to the face when extra weight had developed before a fall.

I am personally acquainted with the experiences of five different operations in straight-face systems which were more or less subject to the same physical conditions. Of these five there was but one which I would call successful, and I attribute this success directly to the man

in charge of the working face. He is well acquainted with the characteristics of the seam, the roof, and the bottom, and has learned to recognize the warnings which are given by the top. He had, so far, not lost a face due to the top riding over his cribs, and the only lost productive time has been when the haulage conveyor was being moved forward.



In reviewing the operating experiences by these two systems illustrated in figures 1 and 3, I have arrived at the conclusion that the success or failure of longwall faces is due not so much to the nature of the overlying strata as to the knowledge and the judgment which is used by the men in charge to conform to the requirements which these natural conditions impose. Too often a seeming failure of loading or conveying machinery is charged to the equipment or the mining method used when in effect the failure should be charged to the lack of judgment of the operating men. The superintendent who intelligently studies the natural characteristics of the coal and the overlying strata is the type of man who will make mechanized mining a profitable operation.

Room and Pillar Mining With Conveyors

By GEORGE J. KREBS *

Description of conveyor mining in room advancement—Seam 28 to 36 inches thick—Conveyors eliminate taking bottom in rooms and have also increased the production per man employed—A higher percentage of lump coal is produced than by hand loading into mine cars—Three units operating with crews on tonnage rate and average from 70 to 100 tons per unit shift

NEARLY four years ago, because of the necessity of decreasing the mining cost, the Reading Iron Company's Somerset Coal Department, at Stoyestown, Pa., decided to try, by various methods of mining, to increase the tonnage of coal mined per man per day. With this end in view, the management tried several plans with more or less success before adopting the present conveyor system used in mine No. 3.

The coal mined is the "C" Prime seam varying from 28 to 36 in. in thickness, of excellent quality, free from binders; the roof is 20 to 30 ft. of very hard

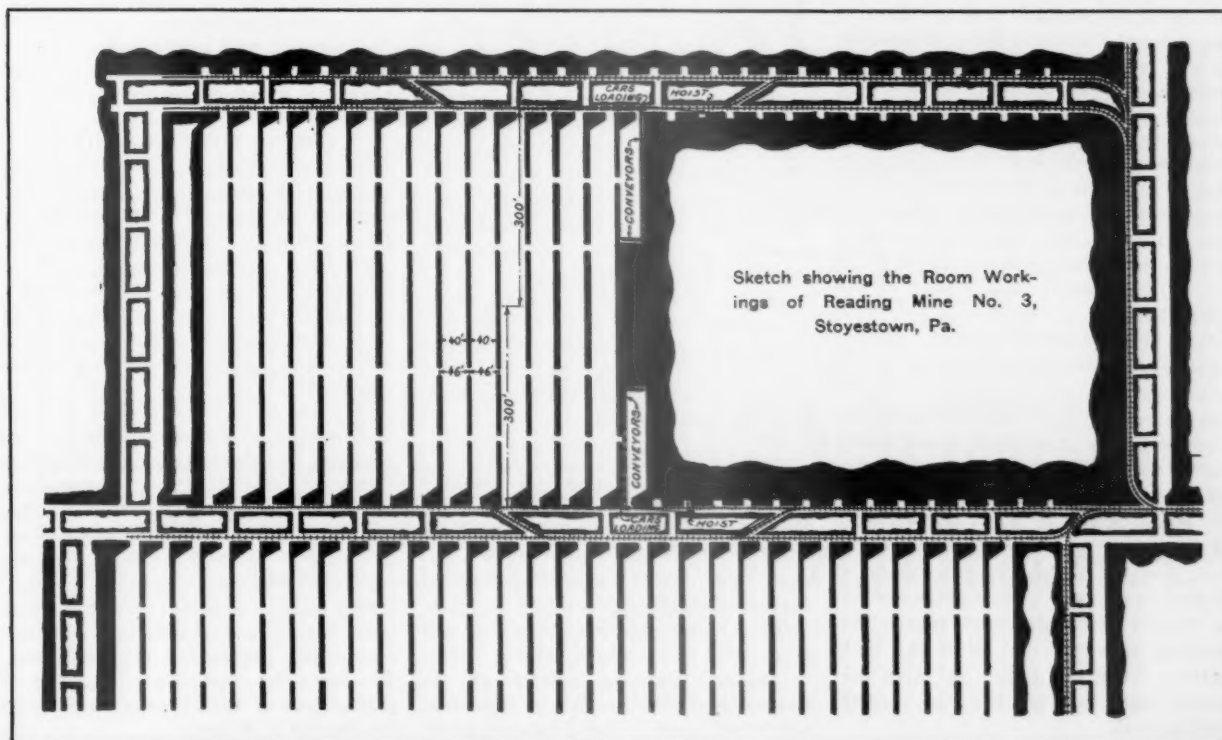
sandstone with an overburden of sand rock, slate, etc., 120 to 250 ft.; the bottom is slate and bony coal 5 to 10 in. thick, under which is 6 ft. of limestone.

Main entries are driven 1,500 ft. apart and pairs of butt entries on 40-ft. centers are turned every 600 ft.; the rooms are driven 40 ft. wide on 46-ft. centers, for a distance of 300 ft., leaving ribs of approximately 6 ft. wide, which are not recovered. The rooms are necked as the butts advance and are 14 ft. wide; on the fourth cut, or 24 ft. from the butt entry, the room is at its full width; the room is posted on 4 by 6 ft. centers and no posts are removed excepting when a fall of roof is desired. The roof condi-

tions are good. The room stumps are left standing along the butt entry for sufficient distance to furnish standing space for the required number of empty cars (15 to 18) for a distance of 200 ft.; these chain pillars and heading stumps are taken out by pick men following the extraction of the room coal.

In rooms where the coal is loaded into mine cars by hand, the bottom must be lifted the width of the track ties to provide sufficient height to enable the storage-battery locomotives to place empty cars at the face and remove the loaded cars; the lifting of this bottom is paid for as room yardage. In rooms where conveyors are used, there are no tracks

* Superintendent, Somerset Coal Department, Reading Iron Company, Stoyestown, Pa.



and no bottom is lifted, thereby saving the yardage cost, time of lifting bottom and cost of storage-battery-locomotive operations. Only one room is worked at a time off the butt entry so that there is no interference or congestion along the haulageway in placing the mine cars for loading. In butt entries where roof is taken for height it is necessary to take down roof in the room necks for a distance of about 6 ft. to furnish head room for the loading boom of the conveyor, while in the entries, where the height is obtained by removing the limestone bottom, there is no preparation necessary in the room necks for the loading boom.

Each room is equipped with a Lorain double chain steel flite main conveyor laid in 6-ft. sections as the room advances to a total length of 300 ft., which is connected in tandem with a loading boom, all of which is driven by a 20-hp. motor through reduction gears at the discharge end of the conveyor; two 12-ft. auxiliary belt conveyors with 14-in. belts, driven by $\frac{3}{4}$ -hp. motors, or one 25-ft. auxiliary drag chain conveyor driven by 2-hp. motor; one 5-hp. Brownie hoist with remote control; one 12-in. Coppus Vane blower fan with 12-in. canvas Ventube, one electric coal drill, and one Goodman low-vein mining machine.

The power unit, with switchboard, is placed in the room neck. The main conveyor is placed parallel to and 6 ft. from the rib; the face conveyor is placed parallel to and about 18 in. from the face of the coal. The face is undercut to a depth of 6 ft. by the mining machine, which remains near the face at all times and is moved about without the aid of a truck; undercutting is begun when loading out is about one-third completed, the machine is operated by one man, who shovels the bug dust direct into the face conveyor; 6-ft. shot holes are drilled with an electric coal drill by one man following closely after the undercutter. These holes are spaced on 6-ft. centers, rib holes being started about 18 in. from the rib and ending at the rib; each hole is loaded with one stick of $1\frac{1}{4} \times 8$ Coalite M powder. Before shooting, a 6-ft. section is added to the main conveyor, and the auxiliary or face conveyors are moved near the face; the main conveyor is reversed and timbers and material are sent in from the entry as needed. A row of posts 4 ft. apart are set 6 ft. from the face along the back of the face conveyors. After the shots are fired the Coppus blower, which is located in the room neck, is again started to remove the smoke and supply the working face with air from the butt entry. When the smoke has been removed from the face the men resume loading coal.

The time required for one cycle is as follows:

Undercutting	35 minutes
Drilling, shooting, etc.....	15 minutes
Lengthening conveyor.....	20 minutes
Loading coal.....	80 minutes
Total.....	150 minutes

The usual performance in the room advancement is to complete three cycles per shift of eight hours.

The haulageway along the entry is laid with 40-lb. steel on 36-in. gauge; the cars are of $1\frac{1}{2}$ -ton capacity and are delivered in trips of from 15 to 18 cars and are moved at the loading boom by the Brownie hoist; a gathering locomotive, with crew of two men, serves the three conveyor operations as well as other sections of the mine.

A Brownie hoist is placed on the butt entry at a point 75 to 80 ft. ahead of the loading room in the direction the loads are to be moved, with the control near the room neck for the convenience of the car trimmer, who uses the hoist to shift the trip of empties under the loading boom; this car trimmer also has the controls of the main conveyor, hoist, and fan; messages from the face are conveyed to him by an electric signal system.

Each conveyor crew consists of six men, five at the face who cut, drill, shoot, and load the coal as well as set timbers and move the face conveyors, and the man mentioned above who operates the hoist and the controls on the butt entry.

The company contracts on a tonnage basis with one man for each conveyor unit, and he supplies the other men for the crew. Mine No. 3 has three units, and each one is averaging 70 tons per day of eight hours, while at times 100 to 105 tons per shift have been loaded by one unit.

A room operated with conveyors will produce during each working shift a tonnage equal to that which would ordinarily be mined from five rooms with hand loading into mine cars.

The conveyor crews are loading nearly 12 tons per man per shift of better prepared and lumpier coal than the miners who are hand loading into cars 6 to 8 tons of coal which has been cut for them by a machine operator.

MECHANIZED MINING—THE BIG QUESTION

(From page 368)

and dry cleaning equipment on the smaller sizes of coal. Many operators are afraid that mechanical loading means a dirtier coal, or higher ash content, which will make their coal unmerchantable. With the present cleaning facilities on the market today it is possible to clean coal economically, and in many cases it would

figure out that the decrease in cost made by mechanizing a mine would be greater than the increased cost of additional cleaning, causing an overall saving and also put out a better product after additional cleaning with mechanized mining, than before the installation of mechanical loading equipment. The above factors would be true at some mines under certain conditions, but might not work out at mines with more unfavorable conditions.

Again, due to the large number of elements entering into the mechanization of any one mine, it is the hope of the Committee on Mechanized Mining that the industry at large give out such facts concerning their particular conditions at any one mine to representatives who are trying to collect such data, that the data so obtained can be properly published in a general way to help further the mechanization of mines of the country and help save considerable loss of money in duplicating experimentation which has already been made.

There has been a marked increase in interest in mechanical loading since 1924, and since that date there are quite a number of mines that are completely mechanized, many with the large part of their mines mechanized, and many that are more or less going through the experimental stages.

There are, of course, many who have not made a start, but in all cases, even though a mine is completely mechanized, the need of information as to the progress that is being made under different conditions is large, and changes from present methods and equipment will be made and used by the mines who are now using a certain method, but would change if a better one presented itself.

COKING POWER OF COAL

The coking power of coal is being studied at the Pittsburgh and Seattle experiment stations of the United States Bureau of Mines. At Pittsburgh the coking constituents are extracted by benzene under pressure and their properties are studied. At Seattle the strength of cokes produced from different coals under standard conditions is being measured.

An outline of important points in inspection of installations of electrical mine equipment is contained in Information Circular 6098, recently issued by the Bureau of Mines. Detailed suggestions in regard to the inspection of power circuits, light circuits, telephone circuits, trolley circuits, switches, electric locomotives, electric hoists, electrically operated coal-cutting equipments, etc., are given. The paper also contains a selected list of publications of the electrical section of the Bureau of Mines.

MINING *with Pit-Car Loaders*

Pit car loaders have proven satisfactory over a year's operation. Working in a coal seam with draw slate and heavy variable grades—Room and pillar system used—Two machines comprise an operating unit. Special care taken to produce lump coal

By GEORGE LINDSAY *

TWO 38C Jeffrey pit-car loaders were installed and put to work in the J. K. Dering Coal Company's mine No. 2 at Eldorado, Ill., during the latter part of February, 1928. The machine is the self-propelling type and is used in producing coal from rooms only.

The Eldorado mine is in the No. 5 seam and averages 6 ft. in thickness in the section being worked. Overlying the coal is draw slate averaging 6 in. in thickness which falls when the coal is shot. Above this is the main roof, which is a gray slate, making a good roof except where slips occur. The bottom is made up of hard fire clay. The lay of the coal is irregular. Grades up to 14 percent are encountered.

The room and pillar method of mining is followed. Room entries are driven 16 to 18 ft. wide and ordinarily are driven to the boundary before rooms are worked. Room centers are 50 ft. and they are driven 250 ft. deep. All rooms are 30 ft. and breakthroughs 14 to 16 ft. wide.

* Superintendent, J. K. Dering Coal Company, Eldorado, Ill.

The machines are worked as a unit and produce an average better than 170 tons per shift. In ordinary operation each loading crew will clean up two to three places a shift. However, to insure steady operation and guard against loss of production through mechanical troubles in cutting and drilling equipment or from roof fall, bad roof, etc., the machines are allotted 10 rooms.

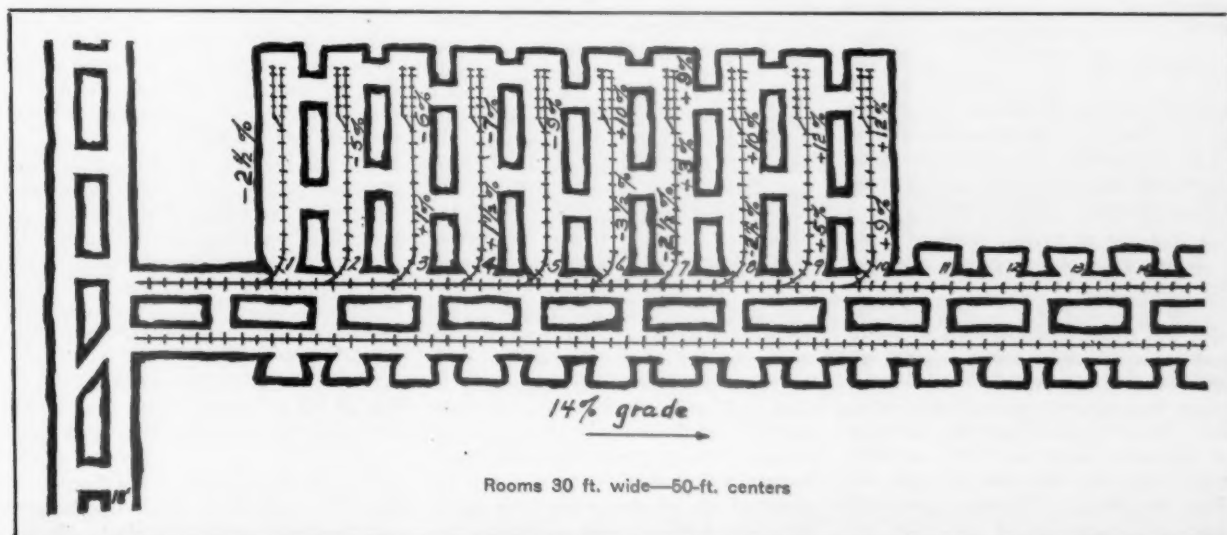
Sixteen to 18 men comprise a crew, depending on the amount of dead work, bad roof, etc. A motor is assigned to the unit and carries with it a motorman and a trip rider.

All cutting and drilling is done on the day shift with shortwall machines and power drills, respectively. Places are cut 6 ft. deep, the machine making its own bottoms. In order to obtain lump coal, special care is taken in preparing and shooting. The curf is cleaned of all machine cuttings and places properly snubbed. Holes are charged with small charges of permissible powder and all fired together by electrical detonators. Draw slate and other impurities are

cleaned off the coal and bad roof is taken care of, so that when the machine is moved into a place the loading crew can give practically their entire attention to loading.

Cars are delivered to and from the loaders by the motor crew. Ordinarily the loaders are waited on alternately. In new rooms the loaded car is taken from the machine and placed on the entry ahead of the room. An empty car is then delivered to the machine and is being loaded while the motor is in attendance at the second machine. Loaded cars are placed in adjacent rooms, from where they are picked up by a relay motor and taken to the parting.

In addition to handling the loaded and empty cars, the tending motor is used to assist the loader and cutting machine in moving from place to place. Cars ranging from 36 to 42 in. in height, when loaded under the hand-mining system, averaged 5,500 pounds. When conveyor loaded, the average is about 800 pounds less.



Track is layed on sights in center of rooms. When starting to load out a place the machine is set well up into the loose coal so that as large an amount as possible can be raked into the loading pan without having to be shoveled. As the coal is loaded ahead of the machine, it is moved up. Cleaning out corners is the most difficult part of loading. Usually in wide rooms and in cross cuts a light belt side conveyor is used to convey the coal to the loader.

Intensive cleaning at the face is not attempted. Only the larger pieces of impurities are thrown back. Inspectors on the tippie picking tables are relied on to remove all impurities.

Because of heavy grades, empty cars placed at the machine for loading are secured by a safety chain fastened to the track as a safeguard against the car getting away and doing damage to equipment or injury to persons. In this fixed position cars can only be loaded two-thirds full, but when the motor returns the car is moved and loading completed. This is quickly done, for the reason that the shovelers, while waiting, fill the conveyor full of coal, and it requires but a few seconds to complete the loading.

When rooms have been advanced about one-half their depth turnouts are layed near the face, as shown by the sketch, to provide close switching in order to reduce car changing time. Other methods were tried out in handling cars but were discarded for the present one.

After about a year of operation the pit-car loader has proven its value in meeting conditions in this mine. Only a small part of the tonnage is being produced by that method, but could be considerably increased at any time if desired without changing the existing plan of mining.

ROCK DUSTING at NEMACOLIN MINE

(From page 373)

(d) The location of the source of ignition in the mine with particular reference as to whether it is in a confined space, such as in a room or a development entry or in a place where the explosive forces have free expansion such as in a gob section or along a haulage entry.

3. The use of trough barriers is not recommended where conditions are such that generalized dusting of the air courses can be effected. Trough barriers will stop the propagation of a coal dust explosion under certain conditions, but there is always the element of chance that they will not be totally effective. Some types of barriers will stop an explosion wave of slow velocity; other types will take care of high velocity explosions. No one type will handle all characters of coal dust ex-

plosions. Furthermore, it has been found that the location of the barrier with reference to its distance down from the roof is of considerable moment. For instance, a barrier located one foot down from the roof might stop an explosion, yet, when placed two feet below, it would have no such effect. In all, the value of trough barriers is questionable.

In view of the results of the mine explosions in partly rock dusted mines, the management of the Nemacolin mine of the Buckeye Coal Company decided that a policy of complete dusting would be inaugurated and carried to completion at the earliest possible date. This program was to include the dusting of all haulage entries, air courses, rooms, development entries. Particular stress was laid on the dusting and re-dusting of rooms and development entries, these being kept at all times up to the last breakthrough and past. This was done because it was recognized that in these places, gas was more likely to be encountered and here were confined spaces ideal for propagating a coal dust explosion with the maximum violence.

The first step in this program was to procure the most modern equipment on the market, initial cost being a secondary consideration to efficiency of operation. After all, the fixed charges on equipment of this nature are but a small proportion of the total cost of rock dusting. An investment of approximately \$10,000 was made in three machines, all carrying the approval plate of the United States Bureau of Mines.

One of these machines is of the so-called high pressure type and is used exclusively for dusting the return air courses and other places inaccessible to machines which are designed simply for use on track entries. This type of machine is different from the types formerly in common use in that a rotary positive pressure blower is used as an air-producing device instead of a fan. This blower develops upwards to 175 inches water gauge pressure, making possible the carriage of the rock dust through long lengths of hose. Of the 14 main entries being driven at the Nemacolin mine, only the middle four are track entries. To reach the outside entry from the nearest track entry, 700 feet of 3-inch hose are required. The ratio of the labor cost to material cost in dusting of this kind is necessarily high because of the time required to move the hose from one air course to another or along the same air course. The crew of three men employed must be familiar with the mine layout and have definitely in mind just what entries are to be rock dusted. The foreman of this crew has a map of the section of the mine where dusting is in progress, upon which he marks off the advance made each night. This map, together with a detailed re-

port, is turned in at the end of each shift to the mine foreman who passes them on over his signature to the superintendent's office.

Because of the large cross-sectional area of the return air courses and because it is not expected that redusting of these air courses will be required for about two years, an application of 6 to 10 pounds per linear foot is being made. About three to five tons of dust are being distributed over 1,000 to 1,500 feet of entry in an average shift. The high pressure machine is being double shifted at every opportunity, because its work does not interfere with the general mine work, all the dust being distributed in return air courses. It is run into the breakthroughs and allowed to remain on a piece of temporary track while the hose is used to cover 1,000 to 1,200 feet along each one of the four parallel air courses from the one position of the machine. All the air courses have not been dusted as yet, the return air courses into which the gob sections were bleeding being taken care of first.

The other two machines bought were for the use in dusting the haulage entries, rooms and development entries. It was thought that two machines would be required because of the large area of workings of the mine. Both of these machines are being run practically every night and over the week ends, both day and night. It is believed that these two machines are of the highest capacity procurable on the market at present.

A high capacity machine is advantageous because its actual operating time usually is but 40 percent to 50 percent of the total shift, and it is, therefore, desirable to be able to accomplish as much as possible in that short time. The operators of these machines continually come in contact with cutters, shot-firers, sprinklers, supply men, and fire bosses, to whom they must give way. The ideal time for rock dusting is over Saturday night and Sunday and it is during this time that the full efficiency of the machines is obtained. It is to be hoped that, at some time in the near future, all the necessary rock dusting can be done by these two machines.

The management of the Buckeye Coal Company collaborated with the manufacturer in the design of these machines for use on track entries. A number of interesting features may be noted from the photographs with this article. The dust distribution is effected automatically by means of a three-sided cast iron nozzle with deflectors on each side, making possible the control of the direction of the projection of the dust. The air supply is such that a very high dust discharge rate is obtainable for which reason its efficiency is mainly dependent upon the ease with which the hopper may be loaded with rock dust. These

machines are the first ones built with the hopper at the rear end of the machine next to the mine car of dust. The hopper is at the same height over the rail as is the mine car. An apron attached to the end of the hopper working on a hinge may be swung over to rest on the mine car over which the 80-pound sacks may be passed. The crew consists of three men, one running the locomotive, one in the mine car of dust who passes the sacks to the third man who stands on the running board on the rock duster emptying the sacks into the hopper of the machine. Progress along the haulageways is made at the rate of about $\frac{1}{2}$ mile an hour when making a 4-pound per linear foot application. The machine discharges about four to five tons of rock dust per hour. One hundred and six 80-pound sacks have been distributed in 30 minutes and a high point of 850 80-pound sacks, or 34 tons of dust have been distributed with one machine in an eight-hour shift.

It is expected that, within the next three to four months, literally every excavation in the Nemacolin mine will be rock dusted. At the time of the writing of this article, in early March, all the haulage entries, rooms and development entries have been rock dusted and about 40 percent to 50 percent of all the return air courses. About two tons of dust have been placed on each overcast. The north side of the Nemacolin mine is completely rock dusted in the literal sense of the word. As stated previously a little over 7,000 tons of rock dust have been distributed up to March 1, 1929, and about 115 tons per week are at present being used.

The cost of rock dusting Nemacolin mine during 1928, when about 4,000 tons of rock dust were used, was \$.022 per ton of coal mined. This cost will average from \$.006 to \$.007 per ton in the future. The relatively high cost during 1928 is due to the amount of return air course dusting which was undertaken and the amount of dust applied per linear foot in these air courses. Also a considerable quantity of rock dust, in cloth sacks, has been placed in various strategic points throughout the mine to be used only in case of fire.

It is not expected that any redusting in these air courses will be necessary for the next two years. It also will be recognized that the length of the air courses is approximately twice that of the track entries. In addition, the high capacity track entry machines were not obtained until the early part of this year. In figuring these costs, the rock dusting equipment was depreciated over eight years.

This article was written because it was believed that many other companies would be interested in learning of the

efforts of one company to completely rock dust its mine, particularly a company whose mine presented probably one of the most difficult rock dusting problems that could be encountered. The problem of dusting a mine with a two, three, four or five entry system is a simple one compared to this, and naturally, far less costly. The evidence of the efficacy of rock dusting in prevent-

ing the propagation of coal dust explosions are sufficient for the management of the Nemacolin mine of the Buckeye Coal Company to feel entirely justified in the expenditure of the amount of money it has. What has been accomplished has given them a feeling of absolute security against the possibility of a widespread coal dust explosion.

THE FLUORSPAR INDUSTRY IN 1928

NOTEWORTHY features in the fluor spar industry in 1928 were the substantially increased domestic shipments—the largest since 1922; the decreased imports (chiefly from Germany and the United Kingdom)—the smallest since 1923; the resumption of fluor spar mining in Nevada; the greatly increased domestic production of acid-grade fluor spar—the largest since 1920 and more than four times that in 1927; and the increase, effective November 16, 1928, in the rate of duty on fluor spar, containing not more than 93 percent of calcium fluoride, from \$5 a short ton to \$7.50 a short ton, according to a statement prepared by Hubert W. Davis, of the United States Bureau of Mines.

The fluor spar shipped from mines in the United States in 1928 amounted to approximately 140,631 short tons and was valued at approximately \$2,658,549, as compared with 112,546 tons, valued at \$2,034,728, in 1927. Thus there were increases of 25 percent in quantity and of 31 percent in total value as compared with 1927. Fluor spar was shipped from Colorado, Illinois, Kentucky, Nevada, and New Mexico in 1928, but Colorado and New Mexico were the only states to record decreases.

The reported shipments of fluor spar for use in the manufacture of steel, glass, enamel and vitrolite, and hydrofluoric acid were more than in 1927, but the shipments to foundries were less, and the quantity exported was about the same as in 1927.

The general average value i. e. selling prices per ton f. o. b. shipping points for all grades of fluor spar in 1928 was \$18.90, which is 82 cents more than the average for 1927. The increase in the general average value for 1928 is due to the larger production and higher selling price of acid-grade fluor spar. The gen-

eral average value of the fluor spar shipped to steel plants in 1928 from the Illinois-Kentucky district was \$15.27 a ton and from the Colorado-New Mexico district \$12.19 a ton. These values compare with \$16.59 for the Illinois-Kentucky district and \$13.72 for the Colorado-New Mexico district in 1927. This difference in average values represents chiefly economic factors in marketing rather than differences in quality of fluor spar from these two districts.

STOCKS AT MINES

According to the reports of producers the stocks of fluor spar at mines or at shipping points on December 31, 1928, amounted to \$10,433 short tons of gravel fluor spar, 999 tons of lump fluor spar, and 714 tons of ground fluor spar, a total of 12,146 tons of "ready-to-ship" fluor spar. In addition there was in stockpiles at mines at the close of 1928 about 60,500 short tons of crude (run-of-mine) fluor spar which must be milled before it can be marketed and which is calculated to be equivalent to about 35,000 tons of merchantable fluor spar. These stocks compare with 23,402 tons of "ready-to-ship" fluor spar and 49,231 tons of crude fluor spar on December 31, 1927. Thus the stocks of merchantable fluor spar decreased about 48 percent but the stocks of crude fluor spar increased about 23 percent as compared with 1927.

FLUORSPAR IMPORTED INTO THE UNITED STATES, 1927-1928, BY COUNTRIES, IN SHORT TONS* (General imports)

Country	1927	1928
Argentina .....	.....	20
Belgium	21	.....
Canada	560	.....
China	449	756
France	11,711	15,072
Germany	31,829	17,601
Italy	449	1,033
Spain	978	680
Union of South Africa	7,089	2,661
United Kingdom	18,449	9,360
	71,515	47,183

FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, 1927-1928, BY STATES

State	1927			1928		
	Short tons	Total	Average	Short tons	Total	Average
Illinois	46,006	\$863,909	\$18.78	65,884	\$1,154,983	\$17.53
Kentucky	57,495	1,040,338	18.09	69,747	1,426,766	20.46
Colorado	6,432	130,481	14.43	5,000*	76,800*	15.36*
New Mexico	2,613					
Nevada .....	.....	.....	.....	.....	.....	.....
	112,546	2,034,728	\$18.08	140,631*	2,658,549*	\$18.90*

* Approximate and subject to slight revision.

NEWS OF THE MINING FIELD

Bunker Hill & Sullivan Will Double Capacity of Lead Refinery

The capacity of the lead refinery of the Bunker Hill and Sullivan Mining Company will be almost doubled by enlargements to cost perhaps \$250,000, it has been announced by Frank M. Smith, smelter director at Kellogg, Idaho.

The Bunker Hill will increase its output from 70,000 tons per year to 120,000 tons, Mr. Smith said.

Twenty-five years ago Bunker Hill company, which had a contract with the American Smelting for handling of its output, decided to build its own smelter and refinery. American Smelting began suit to restrain Bunker Hill. A legal battle followed, and was settled by a compromise, which gave American Smelting a 25-year contract for half the output of the Bunker Hill. The contract expires February 1, 1930.

"In order to handle this additional ore and refine the metal, it will be necessary to build additional equipment, which will nearly double the output of the Kellogg lead smelter," Supt. A. F. Beasley said. "The present output of the plant, most of it from the company's own mines, is about 70,000 tons of lead a year. The additional equipment will bring this up to 120,000 tons a year."

Plan Electrolytic Zinc Plant in Canada

Letters of incorporation are being issued by the Government of Ontario for a new \$10,000,000 company which will build near Sudbury a copper refinery and electrolytic zinc reduction works, the first unit of which will cost upward of \$4,000,000, and which will signalize the beginning of one of the most important mining-industrial developments of Ontario.

The companies associated in this enterprise are Consolidated Mining & Smelting Co., International Nickel, Ventures, Ltd., and the Sherritt-Gordon Co. The plant to be started will be the first unit and will have a capacity of 10,000 tons a month. As the production from the Froid mine and the properties of Ventures and Sherritt-Gordon become available in addition to those of Consolidated Smelters, it is anticipated that the capacity of the plant will be doubled and later possibly trebled.

Homestake Mining Gets Options on Golden Reward and Mogul Properties

The Homestake Mining Company, of Lead, S. Dak., owners and operators of the largest gold mine in the world, has secured options on the Golden Reward and the Mogul mining properties, west of Lead, with a view to further development of these old producers providing a survey of the ore bodies indicates the feasibility of the project, it was announced by B. C. Yates, general manager of the Homestake Mining Company.

The combined Golden Reward and Mogul properties comprise several thousand acres in the Ruby Basin, several miles west of Lead. Development at these well-known old producers has been dormant since shortly after the World War, when so many of the smaller mining enterprises in the Hills closed down because of high production costs and other unfavorable conditions.

The engineering department of the Homestake, Mr. Yates said, will go to work with diamond drills as soon as the weather permits, and the samples of ore from the two properties thus obtained will be analyzed for gold content. If the tests warrant, the mining company will go ahead at once with the full development of the property.

The Golden Reward property consists of approximately 3,000 acres, and the Mogul property in the neighborhood of 1,800 acres, or a total of 4,800 acres covered by the two options.

Commerce Mining & Royalty Company Buys Metals Exploration

Sale of the holdings of the Metals Exploration Company, in the Tri-State District, to the Commerce Mining and Royalty Company was announced April 6 by R. F. Keith and George W. Fowler, joint owners of the Metals company.

Holdings of the Metals Exploration consisted of the Mary Ann mill and lease, consisting of 197 acres in the Oklahoma field, and a 160-acre lease in the Kansas district, southwest of Baxter Springs.

Fowler and Keith purchased the Mary Ann holdings about a year ago, after completing a comprehensive drilling campaign during the term of an option they held on the property. A considerable tonnage of lead and zinc was developed

and later the mill was improved by the addition of a float plant and other modern equipment.

The Kansas lease is considered of major importance. More than 70 drill holes have been put down on the tract, and most of them show three rich runs of ore, the first run coming in at 120 ft. and extending down to the 185-ft. level, the second coming in at the 230-ft. level and extending down to the 265-foot level, while the Baxter sheet ground formation is struck at around the 290-ft. level. A shaft was sunk on this lease several months ago to the upper run of ore.

Purchase of these properties by the Commerce company makes that company one of the largest owners of leases in the Baxter Springs district. The company is the largest owner of mines and leases in the Oklahoma field.

Morenci Branch Leads in Phelps Dodge Safety Contest

Employees of the Copper Queen Branch, Phelps Dodge Corporation, made their first perfect monthly score in the no-lost-time accident contest being conducted between the five branches of the corporation, tying with the Morenci Branch by not having a lost-time accident in March in any department. The Morenci Branch has won the contest for three months, and by tying with the Copper Queen Branch this month it has the record of four consecutive months without a lost-time accident.

Only five lost-time accidents were recorded in the five branches of the corporation, the lowest accident rate since the lost-time accident elimination contest was inaugurated.

The Moctezuma Copper Company Branch of Nacozari, Mexico, was in second place for March with only two accidents, ranking above the Old Dominion Company of Globe with only one, because of a greater number of employees. The Stag Canyon Branch was in last place with two time-lost accidents.

Figured on the basis of 1,000 shifts worked, the rating of the Moctezuma Branch for March was .038; that of the Old Dominion, .045; and of the Stag Canyon, .108.

The Morenci Branch, with a perfect score for January, February, and March, leads in the year to date. The Mocte-

zuma Branch, with a percentage of .020, figured on the basis of 1,000 shifts worked, is in second place; the Copper Queen, with a percentage of .033, in third place; the Old Dominion, .107, fourth; and the Stag Canyon, .103, fifth.

Lead-Zinc Plant to be Erected in Washington by Pend Oreille

A zinc-lead concentrating plant, an electrolytic zinc plant, smelter and refinery is to be erected near Metaline Falls, Wash., by the Pend Oreille Mines and Metals Company, successor of the Pend Oreille Lead & Zinc Company, according to an announcement by Louis P. Larsen, president.

Installation of the plants by September of next year is expected and equipment to the full designed capacity of 2,000 tons daily can be completed in six months after the first half is in commission, it is stated, this being mainly in the enlargement of the smelting plant.

"Plans for the equipment of the property provide for mining plants, tramways or other transport facilities, a hydroelectric plant, unless power is more easily obtained from other sources, power lines, crushing plants and concentrator with a capacity of 2,000 tons daily," says Mr. Larsen.

Tri-State Ground Bosses Form Organization

Ground foremen of the Tri-State District formed a permanent organization and adopted a set of by-laws at a meeting at the Picher, Okla., headquarters of the Tri-State section of the American Zinc Institute, March 26. The name adopted was the Tri-State Ground Foremen's Association.

The ruling body of the association will consist of a central committee of 10, composed of Ben Shields, of the Cortez-King Brand Mines Company; Harry Corbus, of the Commerce Mining and Royalty Company; O. H. Hiatt, of the Eagle-Picher Lead Company; Milton Walker, of the Consolidated Lead and Zinc Company; N. Scott, of the Anna Beaver Mining Company; Dick Harwood, of the American Zinc Company; Charles Duncan and Ray Morris, of the Federal Mining and Smelting Company; Charles Barnett, of the Velie Mines Company; and Charles Proctor, of the Interstate Zinc and Lead Company.

The purpose of the organization, as set out by Chairman Shields and Harwood, a member of the committee, is to discuss the various problems confronting

ARIZONA CHAPTER HOLDS INTERESTING MEETING

More than 100 delegates from all parts of the state were present at the spring meeting of the Arizona Chapter of the American Mining Congress held at Morenci April 1 and 2.

In welcoming the congress, Frank Ayer, of the Phelps Dodge Corporation, spoke on the progress made in mining and the spirit of cooperation now existing between the various mining organizations of the state.

George M. Robinson, chief engineer of the Morenci Branch of the Phelps Dodge Corporation, delved in the history of the Morenci-Clifton District where copper ore was first discovered in 1869. McHenry Mosier spoke on mining practice in the Morenci mines.

The afternoon's session was featured by discussions on the safety first movement and electrical problems of the mines. Speakers included Al Stoddard, chief engineer of the Inspiration Consolidated Copper Company; Captain Hodgson, manager of

the Copper Queen; F. W. MacLennan, Miami Copper Company; and Gerald Sherman, of Morenci.

The second day's session was given over mostly to general inspection trips through the plants of the Phelps Dodge Corporation, including mine, concentrator, shops and power house at Morenci and the smelter at Clifton.

Following the inspection trips the board of directors of the Arizona Chapter met in Morenci for a discussion of important matters concerning this body and worked out plans for the coming year.

The afternoon of April 2 the delegates and visitors were taken to points of interest in the Clifton-Morenci District, including the Metcalf Canyon country, the lower portions of the Coronado Trail, Clifton's old jail in the mountain and various other scenic and historical spots. Others not participating in these trips took part in the annual Mining Congress golf tournament at the Greenlee Country Club.

the various members and cooperate to the end that the employees and the employer will benefit. Prevention of accidents will be one of the cardinal aims.

Fred Nesbitt, safety engineer of the Tri-State Zinc and Lead Ore Producers' Association, has been appointed secretary.

National Metal Exchange to Trade In Copper Futures

Members of the National Metal Exchange, of New York, have unanimously accepted the proposed amendment to the by-laws providing for trading in copper futures. The Exchange now trades only in tin futures.

"We plan to start trading in copper futures about the middle of May," said Erwin Vogelsang, president, "and look forward to an active market in this metal. The copper contract has been carefully drawn to meet the requirements of the industry and we believe it will have the approval of producers, exporters, manufacturers and consumers alike. This new department will supplement trading in tin futures and will add materially to the volume of business transacted in our market."

Calumet & Hecla Makes Offer for White Pine Mine

Calumet & Hecla Consolidated Copper Co. has offered to bid for all real estate and assets of White Pine Copper Co., the total of the latter's liabilities, or ap-

proximately \$115,000. Calumet & Hecla already controls the company through ownership of the entire preferred stock issue of 10,000 shares, and 42,602 of the 85,320 outstanding common shares. It is proposed that assets of White Pine be offered for sale to the highest bidder at public auction, at which sale the Calumet & Hecla bid may be made.

Exploratory work on property of White Pine Co. in Ontonagon County, Michigan, has failed to develop any mineral resources of commercial value, according to President R. L. Agassiz. No operations have been conducted for years. The company has practically no cash or other quick assets and is indebted for current expenses to extent of over \$100,000.

Internal Revenue Bureau Will Not Make Mine Depreciation Study

The Internal Revenue Bureau has decided not to make a study of depreciation in the mining industry. Repeated efforts had been made during the last few years by certain of its officials to initiate such a study, which was opposed by the American Mining Congress and held in suspense by the higher officials. The latest action of the bureau definitely disposes of the question so far as the mining industry is concerned. A recent order of the bureau directs that no further field work or conferences shall be conducted on the proposed depreciation study, nor will any further studies be undertaken. The bureau will compile

and shortly issue a bulletin covering the depreciation studies conducted to date. The decision of the bureau is embodied in the following letter dated April 11 to the American Mining Congress by Deputy Commissioner C. B. Allen:

"In view of the fact that the subject of depreciation study has been taken up with you, it is believed that you will be interested to know that the bureau decided to issue a bulletin at the earliest practicable date, which will embody the results of the depreciation studies thus far made, so that immediate benefit may inure to taxpayers and the bureau. In view of this decision no further field work or conferences are deemed necessary.

"Any data that you have prepared and that you care to submit will be given careful consideration in the compilation of the bulletin. The rates set forth therein will be advisory only and not necessarily controlling. While the bureau does not wish to encourage industries to incur any further expenditures in the compilation of depreciation data, yet any matter that you care to furnish will be helpful in the compilation of the bulletin."

William H. Spry, Land Office Commissioner, Dies

William H. Spry, Commissioner of the United States General Land Offices and former Governor of Utah, died April 21 at his home in Washington, D. C., following a second stroke of paralysis.

Commissioner Spry had not been in good health since he suffered the first stroke, in December, 1927. Following his recovery from that he returned to his duties in the Interior Department.

Commissioner Spry had held the Land Office post since 1921, having been an appointee of the late President Harding. At the time of his appointment he and his family resided at Salt Lake City, Utah. They moved to Washington immediately and have lived there since.

A native of Windsor, England, he had lived in the United States since he was 11. He was 65 years old his last birthday, January 11.

Mr. Spry was Governor of Utah from 1909 to 1917.

Huge Blast Breaks Iron Ore for Season's Output

The largest ore-breaking dynamite blast ever exploded in the Lake Superior ore region was set off in the Volunteer open pit of Pickands, Mather & Company, near Palmer, April 18. It was estimated that more than 600,000 tons of ore were broken by the charge, which weighed 212,000 pounds, or 106 tons.

The powder blast was planted on two benches in 635 drillholes, having an aver-

Utah Chapter Elects Officers

At the annual election of the Utah Chapter of the American Mining Congress, the following officers and directors were elected:

Officers—Imer Pett, Governor; G. W. Lambourne, First Vice-Governor; D. D. Muir, Jr., Second Vice-Governor; J. O. Elton, Third Vice-Governor; A. G. Mackenzie, Secretary and Treasurer.

Directors—L. S. Cates, J. O. Elton, W. Mont Ferry, Homer D. Ford, O. N. Friendly, A. L. Hurley, Thomas F. Kearns, J. William Knight, G. W. Lambourne, Duncan MacVichie, D. D. Moffat, D. D. Muir, Jr., J. A. Norden, W. J. O'Connor, Imer Pett, W. R. Phibbs, E. J. Raddatz, H. A. Tobelmann, J. R. VanEvera, James W. Wade.

age of 51 ft. Approximately 10 miles of fuse were used. It was roughly estimated that the total cost of the blast was \$110,000, which included powder and drilling.

Mines Work Three Months Without Lost-Time Accident

Nineteen mines in the Tri-State District worked throughout January, February, and March without a single lost-time accident, according to records kept by the Accident Prevention Department of the Tri-State Zinc and Lead Ore Producers' Association. They are the following:

Douthat mine of the American Zinc Company.

Beaver, Blue Goose, Central, Grace Walker, Paxson, Jay Bird, Scammon Hill, Wilbur, Webber, and Gosling mines of the Commerce Mining and Royalty Company.

No. 14 mine of the Consolidated Lead and Zinc Company.

Big John, Crawfish, and Goodwin mines of the Eagle-Picher Lead Company.

Mines Nos. 7, 8, and 24 of the Evans-Wallower Lead Company.

No. 5 mine of the New Chicago Mines Company.

Seventy mines, of 18 companies, reporting to the department worked 28,036 man-shifts in the week ending April 11 without a lost-time accident.

Gow Reelected President of North Butte—To Increase Capital

Paul A. Gow was reelected president and general manager of North Butte Mining Company at the annual stockholders' and directors' meeting in St. Paul April 16. J. J. Harrington was reelected secretary of the company. Dan A. Coleman and Arthur Perham were reelected as members of the board of directors. Charles R. Leonard and J. A. Poore were reelected general counsel,

while H. M. Fay was reelected assistant general manager.

Plans to strengthen the financial position of the company by sale of 125,000 shares of stock at not less than \$8 a share were approved by the stockholders.

The company already has approximately \$1,000,000 in cash for working capital and no debts except current expenses, President Paul A. Gow informed the meeting.

Production of ore is now under way at the company's property at Butte, Mont., he reported. While this is necessarily on a small scale now, as work was only begun recently after a two-year shutdown, he stated that production and development will be pushed as rapidly as possible.

Mr. Gow reported the company in good condition and prospects for the future excellent.

Charles W. Goodale Dies

Charles Warren Goodale, mining engineer and expert in copper smelting and refining, who for many years had been connected with the Anaconda Copper Mining Company, died April 11 in Boston. He was 74 years old.

In 1880 he was made superintendent of the mining department of the Boston & Arizona Smelting & Reduction Company at Tombstone, Ariz. In 1885 he took a similar position with the Colorado Smelting & Mining Company, at Butte, Mont., going from there to the Anaconda Copper Mining Company at Great Falls in that state. From 1914 to 1920 he was chairman of that company's bureau of safety. He had been manager at Butte, of the Anaconda's mines there, from 1901 to 1918.

He was a member of the American Institute of Mining Engineers, Mining and Metallurgy Society of America, American Mining Congress, Montana Society of Engineers, and the Alumni Council of the Massachusetts Institute of Technology. He was the author of various papers read before scientific societies.

Mr. Goodale never married. He is survived by two brothers, William W. Goodale, of Honolulu, and David Goodale, of Reading.

Los Angeles Syndicate Takes Over Blue Ledge Mine, Oregon

Word has been received from Medford, Oreg., that the Blue Ledge copper mine, owned by the Guggenheim interests, was transferred April 1 last to a syndicate of Los Angeles investors headed by J. B. Roof and B. F. Miller, Jr. The deal was closed in New York City and the sum involved was said to be more than \$500,000.

AMERICAN ZINC INSTITUTE MEETS

RESearch work and trade extension for the zinc industry occupied the limelight at the eleventh annual meeting of the American Zinc Institute, in St. Louis, April 15, 16 and 17. The convention opened with an attendance considerably larger than any of its predecessors.

W. B. Weisenburger, president of the St. Louis Chamber of Commerce, delivered an address of welcome, to which Eugene H. Wolff, a Tristate district mine president and one of the former presidents of the institute, responded.

President Ralph M. Roosevelt announced that the meeting was to be one of work instead of talk and that most of the committees would report to the open meeting. He then introduced William E. Humphrey, of the Federal Trade Commission. Mr. Humphrey outlined the attitude of the commission towards industries, and offered his and the commission's services in helping the organization to promote its welfare without running afoul of the Sherman anti-trust laws and other Federal statutes. He said that the zinc industry was one of the few industries that had not been cited to the commission for the alleged violation of the Federal statutes.

At the afternoon session Chester Leasure, of the United States Chamber of Commerce, spoke on the "Business of Getting Together," emphasizing the importance of cooperation for economic purposes and the benefits of industrial advertising. Honest and dishonest trade and commerce were discussed. He urged cooperation on part of the members of the zinc interests, which must solve their own problems in their efforts for better trade relations because the natural workings of economic laws can not be changed by statutory legislation.

The tariff readjustment as relates to ores and metals was discussed at considerable length in a paper read by Secretary Tuthill. The executive committee of the institute authorized the filing with the Ways and Means Committee in Washington a request that zinc dross and zinc skimmings be given the same rate as that accorded old and worn-out zinc, fit only to be remanufactured, 1½ cents a pound. The report also explained what had been done in the efforts to obtain a better rate on lithophone and zinc ore and metal.

"Our Traffic Problems" were discussed at length by W. A. Moore, chairman of the General Traffic Committee, who explained the steps that had been taken by the Interstate Commerce Commission regarding the freight rate on zinc, lead and copper throughout the country, which the commission considers inadequate.

Among the other important committees to report was that of the Zinc-Coated Products' Committee. F. C. Wallower, the chairman, explained that differences existed as to what amount of zinc should be used in zinc coating, and that the work has been taken up by the Research Committee representing the zinc-coated products interests, and a more elaborate report will be made at a later session of the institute.

The morning session of April 16 opened with a paper on "The Value of



Ralph M. Roosevelt, re-elected president of the Institute

Research," by Dr. L. D. Redman, who illustrated his subject with charts showing the lines of progress of industries under the influence of research work. He showed the advantages of zinc for many uses on account of its natural peculiar properties in building and decorating, and predicted great prosperity for the zinc industry if a well-directed research is to be conducted.

"Advertising Research" was the subject of a paper by Malcolm McGhee, who explained the waste in marketing and reduction in profits by cutting production and by the incorrect methods used in advertising.

"The Progress of Market Broadening" was the subject of a paper prepared by Theodore Marvin at the special request of the Zinc Institute and it met with such hearty approval that the methods he advocated were adopted unanimously by the institute for its plan of action and many of the members congratulated him upon the excellence of his work.

Mr. Marvin compared the situation of the zinc industry to that of copper and other industries which sought prosperity through increasing trade by means of research work. With the supply of zinc exceeding the demands in spite of the relatively large increase in consumption due to greater developments in the mining fields and the more efficient methods of mining and smelting, he suggested remedies for the zinc industry to better

its condition. The plan proposed for betterment of the marketing situation and for finding more uses for zinc he claimed could best be followed by attaining the following objectives:

(1) A greatly increased demand for zinc.

(2) Close and mutually satisfactory contact of the industry with the consumer.

(3) Elimination of excessive competition from other products.

(4) Recognition by the consumer of progressive industrial leadership which will attain those benefits always enjoyed by industries whose positions are thusly assured.

(5) And following directly from the successful attainment of these results, the industry may confidently look forward to lowered production costs and increased profits.

The institute unanimously adopted a motion by F. C. Wallower, of Joplin, sending the research plan, as outlined by Marvin, to the board of directors for further action.

E. H. Wolff, of Joplin, in commenting on the plan, said that in the first blush 50 cents a ton seemed to be a large amount to expend on such a program, but favored it and said it was time for the zinc people to quit being "pikers." The plan also was approved by John Robinson, of Miami; P. B. Butler and Jesse Starr, of Joplin.

The institute reelected Ralph M. Roosevelt president, at the second day's session. Howard I. Young, who has served as treasurer, and Stephen S. Tuttle, as secretary, ever since the organization of the institute, were also reelected.

The three vice presidents: A. P. Cobb, P. B. Butler and John A. McCarthy, were again chosen for that office at the meeting of the Board of Directors.

The following directors were elected to the board for three years: Edward W. Furst, of Cleveland, Ohio; Benjamin Lissberger, of New York; John A. Robinson, of Miami, Okla.; Edgar L. Newhouse, Jr., of New York; Ralph M. Roosevelt, of New York; Arthur Thatcher, of St. Louis; F. C. Wallower, of Joplin; and B. N. Zimmer, of New York.

In the evening of April 16 the annual dinner was held at Hotel Statler, with Ralph M. Roosevelt as toastmaster and Strickland Gillilan, humorist, as principal speaker. The entertainment features accompanying the feast were under the direction of the Committee on Arrangements, of which Edwin J. Greve is chairman.

The April 17 session was devoted to the installation of officers and miscellaneous business.

INDUSTRIAL DEVELOPMENT CONFERENCE

Fourth annual session at Atlanta by Southern Division of American Mining Congress increases interest in recovery and development of mineral resources—Erskine Ramsay, of Birmingham, chosen as new chairman of Southern Division

WITH a diversified program covering every phase incident to the growing needs of the South, and a vision by its leaders of ultimate development of many of its latent resources, the Southern Division of the American Mining Congress held a highly successful Industrial Development Conference at Atlanta on April 11 and 12. This was the fourth annual conference of this type, which has become a fixture in the South, and drew delegates from all of the Southern States except Arkansas, whose delegation was unable to attend on account of a severe tornado which struck that state at that time, and who were required at home in work of restoration.

The people of Atlanta were gracious hosts and showered many attentions on the delegates in attendance. Their hospitality was in part natural from the general inclination of southern people, but was enhanced on this occasion by its learned, popular, and genial host, Dr. A. V. Henry, of the Georgia School of Technology, former chairman of the Southern Division.

Southern men active in business and industry were supplemented by northern executives who joined in presenting to the conference an outstanding series of addresses on important ways and means of developing the resources of the Southern States. The conference was urged by one speaker to launch an extensive and expensive campaign of advertising and education looking to arousing an interest in capital, both resident and outside the state, in developing the mineral and other resources of the state.

Erskine Ramsay, of the Alabama By-Products Corporation of Birmingham, a leader in coal and other industrial enterprises, was chosen as the new chairman of the Southern Division. Dr. Henry Mace Payne, consulting engineer to the American Mining Congress, was reelected as secretary. Members of the board of governors for the various states were selected as follows:

J. H. Hand, of Yellville, for Arkansas; Leadlay Ogden, of Bradenton, for Florida; Dr. Poole Maynard, of Atlanta, for Georgia; R. M. Watt, of Pineville, for Kentucky; W. F. Chisholm, of Shreveport, for Louisiana; James H. Skewes, of Meridian, for Mississippi; Col. J. W. Harrelson, of Raleigh, for North Carolina; W. W. Smoak, of Walterboro, for South Carolina; Maj. Rutledge Smith, of Nashville, for Tennessee; W. E. Dicker-

son, of San Antonio, for Texas; and Dr. W. A. Nelson, of Charlottesville, for Virginia.

Dr. Henry called the conference in session on the morning of April 11, and after invocation by Rev. Dr. E. M. Po-teat, pastor of the Second Baptist Church



Erskine Ramsay, the new chairman of the Southern Division of the American Mining Congress

of Atlanta, the conference was welcomed by Gov. L. G. Hardman. J. F. Callbreath, secretary of the American Mining Congress, responded and spoke of the desire of the organization to cooperate in developing the resources of the South. An important message on means of developing southern resources was received from Richard H. Edmonds, of Baltimore, editor of the *Manufacturers' Record*, who pointed out the importance of a protective tariff in developing American industries and protecting its labor. The conference paused to pay a tribute to the late Col. William H. Sullivan, member of its board of governors from Louisiana, who recently died, and adopted an appropriate resolution on his services in developing southern industries.

Interesting messages were received from the state delegates, who reported progress all along the line in mineral and other developments in their commonwealths. These reports were made by the following:

Thad Holt, for Alabama; C. O. Haney, secretary, State Chamber of Commerce, for Arkansas; Leadlay Ogden, member of board of governors for Florida; Dr. Poole Maynard, geologist, A. B. & C. R. E., for Georgia; C. J. Neekamp, secretary, Northeast Kentucky Coal Operators' Association, for Kentucky; W. F. Chisholm, Department of Conservation, for Louisiana; E. M. Livingston, Mississippi State Board of Development, for

Mississippi; Dr. H. J. Bryson, state geologist, for North Carolina; E. L. Hertzog, member of board of governors, for South Carolina; Dr. W. F. Pond, state geologist, for Tennessee; H. M. Madison, industrial agent, Sou. Pac. R. R., for Texas; Dr. Wilbur A. Nelson, professor of geology, University of Virginia, for Virginia.

Mr. Ramsay presided over the afternoon session on April 11, at which an interesting address on the relation of topographic mapping and water resources investigations to the industrial progress of the South was delivered by Dr. Thorndike Saville, of the University of North Carolina.

On the evening of April 11 the delegates were entertained at an informal dinner at which the presiding officer was Dr. Payne. Dr. M. L. Brittain, president of the Georgia School of Technology, pronounced the invocation and also acted as the toastmaster. Music was rendered by the Big Bethel Choir, of Atlanta, and an interesting address on "The Promised Land" was delivered by James H. Skewes, editor of the *Star*, of Meridian, Miss. Governor Hardman and Secretary of State Carswell, of Georgia, also gave interesting addresses.

L. J. Folse, of Mississippi, presided over the morning session, April 12, when addresses were made by B. G. Klugh, of the Federal Phosphorus Company, Division of the Swann Corporation, on Research, an essential factor of industrial progress, and by W. L. Churchill, industrial economist, of Evans, Kiet and Hackett, Inc., of New York, on Profits, the basis of all industrial progress.

The presiding officer at the closing session, the afternoon of April 12, was H. N. Madison, member of the board of governors for Texas. Gov. Eugene R. Black, of the Federal Reserve Bank of Atlanta, gave an address on Opportunities for young men in the South; and George H. Bailey, counsel of the American Mining Congress, spoke on the work of that organization in behalf of southern development.

The conference adopted resolutions recommending increased appropriations for topographic mapping of the geological surveys of the Southern States; favoring adequate protective tariff duties on metal and nonmetallic mineral products, and expressing sympathy on the death of the late Colonel Sullivan, member of the board of governors for Louisiana. A resolution of inquiry as to the effect of the Government's flood-control program on the natural gas reserves in Louisiana was referred to a committee consisting of Messrs. Chisholm, Payne, and Folse for investigation and report at the next meeting of the board of governors of the Southern Division to be held in Washington next December.

Northern Operators Seek Reopening of Lake Cargo Rate Case

Western Pennsylvania coal interests, through the Western Pennsylvania Coal Traffic Bureau on April 22 filed with the Interstate Commerce Commission a petition asking reopening of the inquiry into Lake cargo coal rates.

The complaint asked that rates of \$1.91 per ton be fixed on shipments of high volatile coal from southern territory and \$2.06 on shipments of southern low-volatile coal in Lake cargo traffic.

The rates asked are identical with those proposed for the same traffic by Eastern Ohio coal operators a few days before. The proceeding which it was sought to reopen was carried into the Supreme Court last year, when southern operators obtained a restraining order against the refusal of the Interstate Commerce Commission to allow southern railroads to make voluntary reductions in Lake cargo rates.

Date Is Fixed for West Virginia Safety Meet

The fourth annual West Virginia State Safety Day celebration will be held at Charleston, Saturday, September 7.

The date was fixed recently at an all-day conference of mining and safety engineers from all parts of the state with R. M. Lambie, Chief of the State Mining Department.

The Charleston safety day meet will witness a new departure in the conduct of the annual event, started four years ago by Chief Lambie to concentrate attention of the entire state for a day to the safety movement. Teams participating here in September will be the survivors of district meets.

Some of the district tournaments already arranged are Williamson district, June 22, at Williamson; New River and Winding Gulf districts, July 4, at Mount Hope; Morgantown, July 20; Montgomery, July 20; Jackson's Mill, August 10; Logan, August 17; Wheeling, August 31, and Madison, September 2, Labor Day.

"State safety day was started four years ago with a definite purpose," said Mr. Lambie, "that being to arouse interest in accident prevention work throughout the state.

"This interest has been manifested, and today the various sections of the state are asking for dates for local safety days. It is our thought to have a large number of sectional meetings and to bring the best teams from each section to state safety day, the number of teams to depend on the number entered at local events.

"Williamson, Montgomery and Mount Hope, in the order named, have decided to stage events in their respective sec-

tions. This, with the established meetings at Madison, Morgantown and Wheeling, gives us a splendid start."

Davison Coke & Iron Company Formed

Announcement has been made of the formation of the Davison Coke and Iron Company, organized under the laws of Pennsylvania, which will rank among the large producers of coke, pig iron, Portland cement and by-products from coke. The company has purchased 140 acres of land on Neville Island, in the Pittsburgh metropolitan district, and also owns property at Sharpsville, Pa.

On the Neville Island property the company has modernized a blast furnace which has a capacity of 600 tons per day, and has under construction a modern Koppers by-products coke plant, consisting of two batteries of 35 ovens each, with a total capacity of 1,250 tons of coke per day and a gas output of 14,000,000 cubic feet per day. By-products, such as sulphate of ammonia, toluol, benzol and tar will be produced. There is also being constructed a modern Portland cement plant with a capacity of 1,250,000 barrels a year. Construction work is well along and will permit the manufacture of pig iron and cement during May, 1929, and coke in October. Approximately 350 persons will be employed and in excess of \$12,000,000 will be invested in the industry.

The officers of the company are George S. Davison, president Gulf Oil Refining Company, president; Allen S. Davison, vice president Allen S. Davison Company, vice president and treasurer, and Albert P. Meyer, vice president Basic Products Company, vice president and secretary. In addition, directors include C. A. Collins, president Hanna Furnace Company; L. R. Davidson, chairman board Union Drawn Steel Co.; Ralph M. Dravo, vice president Dravo Contracting Company; A. M. Kennedy, works manager Davison Coke and Iron Company; H. Lee, vice president Koppers Gas and Coke Company; John F. Miller, vice chairman Westinghouse Airbrake Company; W. P. Snyder, Jr., president Shennango Furnace Company, and Scott Stewart, president W. J. Rainey & Co., Inc.

Fairmont Operators Seek Reduction In Tidewater and Export Freight Rates

Coal operators of the Fairmont district, West Virginia, met at Fairmont April 10, to determine upon an effort to obtain a freight rate reduction on Tidewater and export coal.

A temporary committee to study the preliminary motions toward a rate reduction was appointed, comprising B. R.

Britt, Clarksburg; A. W. Hawley, Morgantown; Jay R. Snoderly, Fairmont; L. A. Quinlivan, Pittsburgh.

A committee to study coal marketing was named, including Howard Adams, Baltimore; J. E. Parsons, New York City; R. M. Hite, Fairmont; C. C. Shinn, Fairmont. Members of a committee to study methods of lowering production costs are A. Lisle White, Clarksburg; J. A. Adams, Clarksburg; W. J. McBride, Baltimore; and W. Clark Dobie, Fairmont.

Coal Statistics Bureau Moves to Cincinnati

Offices of the Bureau of Coal Statistics have been moved from Huntington, W. Va., to quarters in the Second National Bank Building, in Cincinnati, it is announced by S. W. Patterson, chairman of the Board of Governors.

The Bureau of Coal Statistics was formed in 1925 by a committee of the operators association of the Williamson Field in West Virginia. Its purpose is to collect statistics and information relative to the sale, production and use of bituminous coal and its by-products. Effort is made to keep a record of stocks on hand and unfilled orders, past sales and distribution and production.

Following the organization of the bureau, a group of high volatile operators from the Kanawha district joined in the plan and the offices were removed to Huntington, W. Va. Recently a number of Cincinnati operators have become interested in the work, and it was determined to move the officers to Cincinnati. The bureau is represented in all the coal market centers as well as the operating centers. The work is under the direction of Forrest C. Respass, Secretary, who served formerly as director of statistics of the Hardwood Manufacturers Institute, Memphis, Tenn.

Present members of the Board of Governors are: S. W. Patterson, of the Sycamore Coal Company, Huntington, W. Va., chairman; C. C. Dickinson, Dickinson Fuel Company, Charleston, W. Va., vice chairman; C. A. Cabell, Carbon Fuel Company, Charleston, W. Va.; J. W. Mayhew, W. M. Ritter Lumber Company and Red Jacket Consolidated Coal Company, Columbus, Ohio; C. R. Moriarty, Cabin Creek Consolidated Coal Company, Cincinnati; and L. E. Woods, Crystal Block Coal and Coke Company, Welch, W. Va.; C. R. Moriarty and W. J. Magee, both of Cincinnati, are in charge of the removal of the offices today.

During 1926, a credit interchange department was added to the work of the bureau. This service was at first installed on a modest basis but the files now contain 50,000 accounts, covering territory represented by 34 states, Canada and seven foreign countries.

The Colorado Fuel and Iron Company Reduces Accidents in its Coal Mines in 1928

The following paragraph, taken from the annual safety report of the fuel department of the Colorado Fuel and Iron Company, issued in January, 1929, indicates that there has been a definite movement in accident prevention in the coal mines of the Colorado Fuel and Iron Company during the year 1928:

"We are certain the material reduction in both frequency and severity of accidents during 1928 will lend encouragement to still greater effort during 1929, with the knowledge that definite progress is being made.

"The fatal injury list of 10, while still much too high, is the second lowest year in the history of the fuel department. The lowest year was five, in 1926. That record can be broken this year, and it is up to each and ever one of us to see that it is broken. A large percentage of the fatal injuries in previous years have occurred during the first three months. Let's eliminate that first-quarter jinx this year and for all time. *It can be done.*

"The 455 nonfatal injuries which occurred in 1928 is the lowest since 1918, and a reduction of 202 over the average for the previous five years. The shifts lost for 1928 took a big drop also, being 1,431 lower than for the year 1927 and 2,552 lower than the average for the previous five years.

"Consider these figures seriously for a minute—202 men saved from injury as compared to the average for the previous five years, and 2,552 shifts saved to the workmen by the use of greater caution in the performance of their duties. At \$6.50 per shift, this means \$16,588. Worth while, wasn't it? And think of the homes that have been made happier by the injuries that did not occur."

Second Indiana Fuel Conference

The Second Indiana Fuel Conference, under the auspices of the Engineering School of Purdue University, was held April 4 and 5, and was marked by a splendid attendance of operators, retailers, purchasing agents, representatives of railroads and university officials. Primary interest centered on domestic stokers, fusibility of ash and powdered coal-burners. Vernon Leach, combustion engineer, Peabody Coal Company, Chicago, outlined recent developments in burning pulverized coal. O. L. Scales, sales manager, George A. Enos Coal Company, told of the future of Indiana coal in its logical market.

Governor Harry G. Leslie was present and conferred with operators respecting a survey to find new uses for Indiana coal, this survey to be largely a research effort by Purdue experts. Jonas Waffle,

managing director, Coal Trade Association of Indiana, Terre Haute, acted as chairman of the Resolutions Committee of the Conference.

At a banquet the evening of April 4 Dean A. A. Potter, of the Engineering School, presided and announced a third conference would be held next year. Talks were made by Governor Leslie, President Edward C. Elliott, of Purdue; H. A. Glover, Indianapolis, vice president of the Knox Consolidated Coal Company; Milton E. Robinson, Jr., Chicago, president, National Retail Coal Merchants' Association; and C. B. Huntress, of the National Coal Association.

Coal-Price Fixing in War Upheld

The Supreme Court upheld President Wilson's order during the World War fixing the price of coal.

V. L. Highland, of Harrison County, W. Va., sought to compel the Russell Car and Snow Plow Company, of Clearfield, Pa., to pay a higher coal price fixed by contract.

The Pennsylvania State courts refused to enforce the contract price of \$3.60 a ton, holding that the price fixed by the President under the Lever act of \$2 a ton for a part of the time and \$2.45 for the remainder was binding. Highland challenged the validity of the Lever act and of the authority of the President under it to fix the price of coal, insisting that he was entitled to a settlement at contract price.

R. A. Mitchell Elected to Board of Gulf States Steel Co.

R. A. Mitchell, vice president of the Alabama Power Company, was elected a member of the board of directors Monday, of the Gulf States Steel Co.

Announcement is made that the Gulf States Steel Co. will be in the pig iron market permanently. Its blast furnace at Gadsden, Ala., is now manufacturing foundry iron, the company having plenty of basic iron on its yards. It is estimated that the expenditures for the year on new developments will be \$5,000,000, according to W. H. Coverdale, president.

Reduction in Coal Rates, Indiana to Illinois, June 15

Reductions in rates on coal moving from the Brazil-Clifton and Linton-Sullivan groups of Indiana mines to five Illinois points, effective June 15, have been ordered by the Interstate Commerce Commission.

The lower schedules ordered afford rates ranging from 17 to 26 cents per ton below the present schedules and were found justified on complaints of dealers in coal located at Champaign, Urbana, Fitsian, and St. Joseph, Ill.

Under the new schedules the coal rate to Champaign and Urbana from Brazil-Clifton group of mines will be \$1.25 per ton; to Fitsian, \$1.15; to St. Joseph, \$1.10; and to Mahomet, \$1.30; from the Linton-Sullivan mine the rate to Champaign and Urbana ordered was \$1.45; to St. Joseph, \$1.35; and to Mahomet and Mansfield, \$1.50.

Coal Miner Receives \$60,000 Damage Check

Matt Spann, 44 years old, a former coal miner at Pittsburg, Kans., recently received a check for \$60,000, probably the largest judgment for personal damages ever awarded a coal miner.

The money was paid by the Jackson-Walker Coal Mining Company, of Kansas City, through the circuit court at Kansas City.

Spann's legs were crushed while working in a Jackson-Walker mine. He received judgment for \$50,000 December 22, 1925, and before the supreme court affirmed the verdict \$10,000 interest had accumulated.

Standardization of Mine Tracks

F. C. Hohn, consulting engineer of the Pure Hill Coal Co., of Minersville, Pa., has been appointed by the American Mining Congress as chairman of the Subcommittee on Mine Tracks of the Underground Transportation Committee of its Standardization Division. Mr. Hohn, who is well acquainted with the problems of underground transportation, is planning to revise the existing standard and to expand it to include all of the items that fall within the purview of this committee. The committee is also being reorganized to make it thoroughly representative of all interests.

Ohio's Tonnage Smallest in 30 Years

Ohio produced the smallest tonnage of coal during the year ending December 31, 1928, than it has produced in the past 30 years, according to a preliminary report of the Ohio Industrial Commission. There was a total of 14,540,184 tons produced during the year, compared with 15,762,369 for the previous year. In 1898 the coal production was 14,058,155.

The largest year in Ohio, as far as production goes, was in 1918, when 47,919,212 tons were produced. Production during the past decade has been as follows: 1919, 35,225,908 tons; 1920, 45,227,077 tons; 1921, 33,248,757 tons; 1922, 27,556,555 tons; 1923, 40,904,275 tons; 1924, 30,096,893 tons; 1925, 27,564,760 tons; 1926, 28,039,107 tons; and 1927, 15,762,369 tons.

Anthracite Conciliation Board Elects

Chris. J. Golden, of Shamokin, Pa., president of District No. 9, United Mine Workers of America, was elected secretary of the Anthracite Conciliation Board, at a meeting of that body the latter part of March. Mr. Golden succeeds James A. Gorman, who was recently made umpire of the board, following the resignation of Dr. Charles P. Neill, of Washington, D. C.

Major W. W. Inglis, president of the Glen Alden Coal Company of Scranton, was elected chairman of the board at its meeting for reorganization; Mr. Gorman, umpire; Mr. Golden, secretary; and Michael Hartnedy, of Nesquehoning, treasurer.

Time Payment Plan for Anthracite Announced

A deferred payment plan for financing the retail sales of Reading anthracite has been announced by the Philadelphia & Reading Coal & Iron Company. According to the company, this development is the result of hundreds of requests from coal merchants and will bring together the experience of a successful finance company, the General Contract Purchase Corporation, with the Philadelphia & Reading organization.

"We believe that the purchase of anthracite on a deferred payment plan is sound economically," says President A. J. Maloney. "Anthracite is one of the few commodities purchased in large quantities for future consumption which has not been generally sold by such a plan. It is one of the few commodities so purchasable now which does not promptly depreciate heavily at the moment of sale. It stores indefinitely, so that deterioration does not lose its value. Low payments cover its cost before it is destroyed by use."

Reading Coal-Iron Adds to Its Board

Important additions to the Board of Directors of the Philadelphia and Reading Coal and Iron Company were announced following a special meeting of the stockholders of that company recently.

Heretofore the board was composed of George H. Campbell, assistant to president, the Baltimore and Ohio Railroad Company; Robert J. Cary, vice president and general counsel, New York Central Lines; Pierpont V. Davis, vice president, National City Company of New York; Joseph Wayne, Jr., president, the Philadelphia National Bank; Leon E. Thomas, president, Reading Iron Company; and Andrew J. Maloney, president.

The new members of the board in addition to the above are: Thomas Newhall,

a member of the firm of J. P. Morgan & Co., of New York, and Drexel & Co., of Philadelphia; Arthur E. Newbald, Jr., a member of the firm of Drexel & Co., Philadelphia; Nathan Hayward, president American Dredging Company, Philadelphia, and also president of the Franklin Institute; J. Willison Smith, president Real Estate-Land Title and Trust Company, of Philadelphia.

Provision has been made for an executive committee that will function actively.

Recapitalization for Westmoreland Coal

A special meeting of the stockholders of the Westmoreland Coal Company has been called for June 14 to vote on a plan of recapitalization. It is proposed to change the present 250,000 shares of \$50 par value stock to stock of no par value and to create a corporation under the laws of Delaware with 200,000 shares of no par value stock. The new Westmoreland stock would be exchanged for the present stock on a share-for-share basis. The stock of the Delaware corporation would be distributed to holders of outstanding Westmoreland stock on the same basis.

Under the plan part of the current assets of the Westmoreland Coal Company, its coal, coal lands and surface lands would be conveyed to the Delaware corporation. The coal and coal lands would be leased to the Westmoreland Company by the Delaware company under the plan. The former company would continue as an operating company, while the latter would be a holding company. No financing will be necessary.

Kanawha Valley Mining Institute Formed

An organization to promote the mine safety movement was formed at Charleston, W. Va., April 14, and will be known as the Kanawha Valley Mining Institute.

Ninety-two representatives of Kanawha Valley mines dedicated the association to "to promote safety and efficiency in and about the mines, and to promote good fellowship among the operators and employees and to cooperate with the department of mines in its accident prevention campaign."

Frank O. Harris, general manager of the Cannellton Coal and Coke Company was elected president. Josiah Keeley, general manager of the Cabin Creek Consolidated Coal Company and J. C. R. Taylor, general manager of the Loup Creek Colliery Company, were elected vice presidents. C. O. Morris, director of safety of the state department of

mines, was named secretary and treasurer and W. B. Devaney, assistant secretary and treasurer.

Plans were started at the organization meeting for a district safety day meet which will be held at Montgomery, Saturday, August 3.

Everett Drennen Elected to Board of C. F. & I.

At a meeting of the Board of Directors of the Colorado Fuel and Iron Company held April 23, Everett Drennen was elected a member of the Board of Directors and vice president of the company in charge of fuel division, effective as of that date.

Mr. Drennen, as a former executive for several West Virginia companies has been prominently identified with coal mining for a number of years and is well known throughout the industry.

Experiments Conducted to Determine if Iowa Coal Can be Coked

Experiments to determine whether Iowa coal can be coked have been started by the State Geology Department, in cooperation with state chemists at Iowa City, in an effort to increase the production of the state's mines.

If the experiments prove satisfactory, a market can be found for three times the amount of Iowa coal now sold, James H. Lees, assistant state geologist, stated.

Classification of North American Coals

It is believed that the various proposed coal classification systems can be correlated and combined into a standard system applicable to all North American coals, and, in fact, to the coals of the world, as a result of the work now being done by the Coal Classification Committee of the American Engineering Standards Association, states a review of the committee's work, prepared by A. C. Fieldner, chief chemist, United States Bureau of Mines, who is chairman of the committee. Uniform classification of coal should be a great aid to a better understanding between seller and buyer, and should result in directing each class of coal into the use for which it is most valuable, Mr. Fieldner points out.

The organization and objectives of the American Engineering Standards Sectional Committee on the Classification of Coals are described in Information Circular 6094, recently issued by the Bureau of Mines. This project was initiated at the time of the First International Conference on Bituminous Coal held at the Carnegie Institute of Technology and at the Second Conference held in No-

vember, 1928. The American Society for Testing Materials was appointed the sponsor organization. It organized a committee of 28 members equally subdivided among producers, consumers, and others generally interested. The actual work of the coal classification committee is being conducted by three technical committees of 10 or 12 members each. These are the committees on scientific classification: H. J. Rose, assistant director of research, Koppers Co., chairman; use classification, W. H. Fulweiler, chemical engineer, United Gas Improvement Co., chairman; and marketing practice, F. R. Wadleigh, consulting engineer, chairman. These three committees have formulated their plans and have made considerable progress in getting the work started.

The object of the committee on scientific classification is to formulate a system of coal classification based on the chemical and physical properties of coal with reference to origin and constitution. The use classification committee is charged with the development of a system of classification based primarily on the uses of coal in commercial practice, but this system is to be correlated with the scientific system as far as possible and desirable. The technical committee on marketing practice is collecting and collating information on commercial practice for the benefit of the other two committees.

M. R. Campbell, as chairman of a subcommittee on nature, location, and mode of occurrence of types of American coals, has collected data and descriptions of the different classes of coal based upon subdivision of rank; that is, the various stages through which coaly matter passes in its progressive transformation from peat to anthracite. Another subcommittee on origin and composition of coal and methods of analysis has prepared a preliminary report on the probable errors and limits of accuracy of the American Society for Testing Materials' standard method of analysis and is developing accelerated slacking tests for low-rank coals and lignites. Investigation is being made of the relative merits of correcting coal analysis for water of hydrogen of shale and carbonates as compared with de-ashing the coal before analysis by float-and-sink, oil flotation, or acid-extraction methods. A third subcommittee is making a thorough study of present and proposed systems of classification with a view to correlating the coals in each of the principal systems of classification. Analytical and testing criteria for classifying coal in the different systems are described in the paper just published by the Bureau of Mines.

Coal-Mine Fatalities in March

Accidents at coal mines in the United States in March, 1929, caused the death of 178 men, according to information furnished by state mine inspectors to the United States Bureau of Mines. Twenty-nine of these accidents were in the anthracite mines of Pennsylvania; the remaining 149 were in bituminous mines in various states. The death rate per million tons of coal produced during the month was 4.01, based on a production of 44,391,000 tons, as compared with 3.07 for March, 1928, based on an output of 49,452,000 tons and 152 fatalities. The fatality rate for bituminous coal alone for March, 1929, was 3.79, with a production of 39,347,000 tons, and that for anthracite was 5.75, with a tonnage of 5,044,000, as compared with rates of 2.59 and 6.91, respectively, for March of last year.

Reports made to the Bureau of Mines for the first three months of 1929 show 530 fatalities in coal mines. Of this number 419 were at bituminous mines and 111 at anthracite mines. For this period 157,125,000 tons of coal were produced, of which 138,074,000 tons were bituminous and 19,051,000 were anthracite. The per million ton death rate for the industry as a whole was 3.37; for bituminous coal it was 3.03; and for anthracite 5.83. Compared with February of the present year, there was a slight increase in the death rate both for bituminous mines and for the total bituminous and anthracite, but a slight decrease was shown for anthracite alone.

One major disaster—that is, a disaster in which five or more lives were lost—occurred during the month of March, 1929. This was an explosion at Parnassus, Pa., on March 21, which caused the death of 46 men. March of 1928 was free from such disasters. The first three months of 1929 showed two major disasters, with a total of 60 deaths as compared with three disasters and 46 deaths during the first quarter of 1928. Based exclusively on these disasters, the death rate per million tons of coal mined in 1929 was 0.382 as compared with 0.314 for the first three months of 1928.

Comparing the accident record for the period January to March, 1929, with the same period of 1928, a reduction is noted in the death rate due to falls of roof and coal and electricity, but increases are shown for haulage, gas or dust explosions and explosives.

List of Permissible Mining Equipment

A list of "permissible" mining equipment, including equipment tested and approved, with special reference to safety features, up to January 1, 1929, has been published by the United States Bureau

of Mines. The system under which these devices were tested permits the manufacturer, after his equipment has passed certain tests prescribed by the Bureau of Mines, to mark his equipment with a seal showing that it has been "approved" by the bureau. These tests are designed to insure that the equipment has the minimum requirements for safety in use. The only object of the bureau in making such tests and publishing lists of permissible equipment is to safeguard the lives of workers and to help lessen the hazards of mining.

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Operators Urged to Mine Less Coal

In a report in which he characterizes the bituminous coal industry as "admittedly serious," Secretary of the Department of Mines Walter H. Glasgow places the production of soft coal in Pennsylvania in 1928 as 129,846,603 net tons—a further decline over the last three years.

Any relief, Mr. Glasgow said, must come through a lessening of production and the closing of some of the mines in western Pennsylvania. "Until the overdevelopment is checked and the supply made to fit the demand there can be no permanent relief," he said.

The production in 1927 was 131,644,922 tons and in 1926 was 151,746,464.

"The record is disappointing," Mr. Glasgow continued, "but the predominant discouraging feature of trade is not the comparatively small production, but the proportion of the production that is without profit. The situation is admittedly serious, but does not call for Federal intervention, a remedy so often advocated. The trade should be let alone and in time will solve its own problems and get to a place among the profitable industries of the country.

"If this is to be accomplished, however, there must be intelligent and effective cooperation among the producers. Too many mines are being operated and too much coal is being produced, and until the overdevelopment is checked and the supply made to fit the demand there can be no permanent relief.

"There is a possibility, however, that new markets may be opened to bituminous coal by the expansion of the export trade and by its increased use for the development of by-products."

WITH THE MANUFACTURERS

New Mining Machinery Company Organized by J. F. Joy

The mining machinery developments of the Bethlehem Steel Company, including the Bethlehem Coal Loading Machine, has been recently acquired by J. F. Joy, widely known by his achievements as a pioneer in the field of mechanical loading. A new company, with temporary offices at 260 West Jersey Street, Elizabeth, N. J., is being organized, headed by Mr. Joy, to take up the manufacture and sale of this new line of equipment.

The products of the new company will involve many new and outstanding features in mechanical mining apparatus, including caterpillar-mounted coal-loading machines, caterpillar-mounted universal cutting and shearing machines, and a new form of machines called "Coal Hustlers." The purpose of the latter machines are to so dispose of the coal back of loading machines as to permit of continuous and uninterrupted loading operations.

New Direct-Current Cam Switch

The General Electric Company announces a new direct-current cam switch, designated CR-3108, developed to satisfy the needs of central stations for such a device to control auxiliaries such as pumps, blowers, etc. The switch can also be used for similar non-reversing applications where the current inrush or starting torque is not severe or the operations are not frequent.

The new switch is available in two forms. Both are for non-reversing service, with armature regulation over five points, while one form has field regulation over 22 points. The intermittent armature current capacity is 1,000 amperes, while the same capacity, continuous rating, is 500 amperes. The switches are rated 550 volts, maximum.

"Modernized Coal Mining"

"Modernized Coal Mining" is the title of an interesting brochure published by the Safety Mining Company of Chicago.

It describes the Cardox method of blasting, designed to eliminate smoke, increase lump coal, and make for general safety, not only from explosions but from accidents due to shattered roof.

The Cardox cartridge consists of an alloy steel tube, filled with liquid carbon dioxide, and sealed with a soft steel disc. This cartridge is put into the drill hole, tamped, and vaporized by electrical heat. The escaping gas, through accumulating pressure, forces the coal, without detonation, down and out.

There being neither flame nor fumes, the equipment has been approved by the U. S. Bureau of Mines. It is claimed for the Cardox method that it offers particular advantage to mechanical loading, although adaptable to continuous operation at the face, under any and all conditions.

It is also to be noted that carbon dioxide gas is in itself a fire retardant and that its rapid expansion produces intense cold. Likewise there can be no danger from a blown-out shot; and timbering costs are reduced.

Copies may be obtained upon request to Safety Mining Company, 307 North Michigan Avenue, Chicago, Ill.

Novel Chip Breaker and Guard Devised to Assure Safety

In one of the departments of the General Electric Company's River Works at West Lynn, Mass., great difficulty was caused by flying chips. These chips came from a metal drill used in the special cutting of steel, and were a continual source of danger not only to the workman tending the machine but also to passers-by. In addition, the fallen chips scattered upon the floor proved dangerous as well as unsightly.

A novel device, consisting of a breaker and guard, was installed for controlling these chips. The guard prevents the chips from scattering, while the chip breaker keeps them in one position on the table. This unique device has proven very successful since its inception.

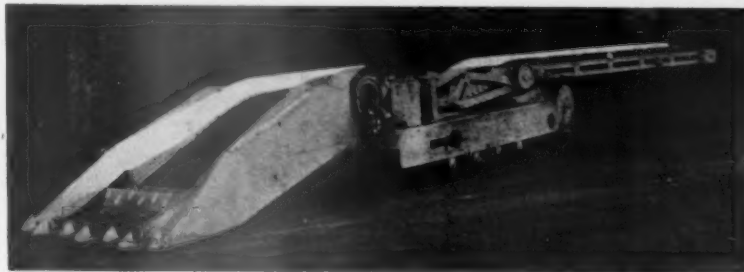
New Loading Machine Announced

The Covington Machine Company, of Covington, Ky., has recently brought out the coal loading machine, illustrated above, built of few parts, simple and rugged enough to stand up under daily use with a minimum amount of upkeep. The machine is furnished to operate on crawler treads only, or for operation on mine tracks; or a combination of the two can be arranged so that machines can be moved from place to place on tracks, then transferred to crawlers for loading.

The method of operation is as follows: Machine proceeds into heading on its own power. Front end is lowered to mine floor with front motor running, operating first conveyor and reciprocating head. The main motor is then brought into action, forcing shovel into coal. When all loose coal is cleaned up, the standing coal is attacked by forcing front of shovel with spear heads under the coal, which pulls down the standing coal and at the same time reciprocating head and conveyor move coal back into car. When finished, front end is raised and machine proceeds to the next place.

A General Electric HM 14 mine locomotive motor is used for the main drive, geared direct to clutch shaft, eliminating all complicated parts. A disk clutch is used for each crawler chain, making the control simple and easy. A G. E. 3-hp. motor is used to drive the rear conveyor, geared direct to drive shaft, and the same size and type motor is used for swinging boom through its range of 180 degrees with a worm and segment. The front digging end conveyor and reciprocating head is operated by a G. E. HM 14 motor, a duplicate of the main drive motor. All motors are totally enclosed, and all electrical equipment can be furnished flame-proof where necessary.

The capacity of the loading machine is approximately two tons per minute.



The new Covington loading machine

New Cincinnati Gasoline Locomotives

The Locomotive Division of The Cincinnati Car Corporation, Cincinnati, Ohio, is announcing its new 1200 series gasoline powered, gear driven, industrial locomotives that embody numerous improvements in design and construction. Four good starting and traveling speeds, both forward and backward, are provided so that marked flexibility in speed and performance is possible. A large ratio of engine horsepower per ton of locomotive is provided so that a very liberal draw-bar-pull is available.

To insure long life and proper functioning of the engines, they are provided with oil purifier, gasoline strainer, and temperature gauge, the latter being mounted on an instrument panel in the cab with gasoline gauge, oil gauge, ammeter, and the different switches for control of ignition, lights and starting equipment. A spray-pump primer is also provided to assist in starting in cold weather.

The clutch connecting the engine and transmission embodies advantages of both the dry and oil clutches and eliminates objections heretofore found with both types in this kind of service. Due to its construction, and the fact that it is enclosed in oil, it can be slipped severely, as is often necessary in starting loads, without any appreciable heating. A power take-off is provided for auxiliary use, such as a winch or hoist.

The drive wheels are located inside the main frame so that the axle bearings are on the ends of the axle, instead of behind the wheels, to afford convenience in lubrication and inspection of the bearings.

Air brakes are optional on all models, but can be furnished for operating on the locomotive alone, or the locomotive and cars together. This can be done on models as small as 8-ton.

The different models in this series are all built in a variety of sizes and track gauges, and adapted for handling either industrial cars or railroad cars, and are recommended where track haulage may be employed.

The Cincinnati Car Corporation is located at Winton Place, Cincinnati, Ohio.

New Switch Does Work of Three Devices

A new switch, CR-7006-F-1, announced by the General Electric Company, takes the place of the magnetic switch, motor circuit switch and enclosed fuses usually required in controlling the operation of a motor. This switch can be applied to control any motor where a general-purpose magnetic switch would be used, and where its special features are desirable. It is compact, easily accessible and readily installed.

The switch consists of three sections: a back portion containing a motor circuit switch, a middle portion containing a base on the front of which the magnetic switch is mounted and on the back of which clips are provided for fuses, and the front cover. The back portion is built for mounting directly on a wall. No flexible connections are used between sections.

Fan Incorporated in New Electric Air Drawing Oven

The General Electric Company announces a new air drawing oven, Type AD, for drawing carbon steel at temperatures up to 750 degrees Fahrenheit. In this oven quality is improved and production is increased as the result of the use of a fan for agitating the air around the work.

Multiple Retort Underfeed Stoker

Combustion Engineering Corporation announce a new catalog on the design of the C-E Multiple Retort Stoker, which has changed materially since the last catalog on this stoker was issued. These changes in design are covered both in the text and illustrations of this edition.

The C-E Multiple Retort Stoker meets the demand for an improved superstation type stoker. Results secured in installations now in operation indicate that this stoker represents a distinct advance in design, construction, and performance.

New Drill Attachment for the Breast Machine

Something new in attachments for mining machines is the recent design of a power drill which may easily be installed on the breast machine. The drill is a complete self-contained unit which may be attached without changing any parts of the machine—a little metal chipping on the motor shell is all that is required.

The new attachment is very similar in principle to the Goodman hitch drill, which has proved itself in the past year. Many of the parts are identical; the main difference is that the new drill is designed to fit the standard breast machines and cut smaller holes.

This new apparatus will drill holes from 1 to 5 inches in diameter. The mechanism is quite flexible in its adjustments, permitting the placing of holes where wanted. It is unusually rugged and completely inclosed. The thread bar is very much stronger and the split boxings and speed regulator are much larger than on those heretofore manufactured.

Alloy steels are used throughout the apparatus. Proper heat treatment of gears and generous surfaces are two factors which assure long life under severe service.

Power is supplied to the drill by the same motor which drives the breast machine chain and, therefore, the drill speed remains practically constant under all cutting conditions. This ample power makes operation easy and gives desirable speed. The drill feed may be regulated by a friction drum controlled by hand.

The new drill attachment gives the breast machine a two-fold purpose—that of undercutting and of drilling. While it has been largely superseded by later types of coal cutters, the breast machine is still in use—as a general purpose cutter in certain fields and for driving narrow rooms or entries at many mines wherein the major cutting is done by later types. There are also many breast machines which have been set aside long since—even charged off the books as having paid for themselves and as having no future usefulness. By addition of the drill to any of these machines an operator obtains at very small cost an excellent entry driver, one which may compete with many of the later types of machines now available.

The drill is a new product of the Goodman Manufacturing Company, Chicago, Ill.

A new drill attachment for breast machines



Big Automatic Skip Loader in Southern Illinois Mine

Recent changes of bottom arrangement at Zeigler No. 1 of the Bell & Zoller Coal & Mining Co. give that famous mine, the oldest in Franklin County, Ill., and the second largest in the world, the most modern coal hoisting equipment.

A two-bucket skip hoist with a travel of 525 ft. had been used to hoist the coal and had performed very satisfactorily. The only difficulty encountered was in loading the skip buckets. They were manually loaded by an air-controlled gate, and the dust in the bottom of the pit prevented the operator from determining when the buckets were full. The sound of the coal falling in the bucket was his only gauge. With this arrangement he either did not fill the buckets or filled them to such an extent that a great amount of coal fell into the pit or was scattered at the dumping point.

The new equipment included a double Link-Belt automatic skip loader. The operating cycle with the automatic loader was estimated to be the same as with the original installation, manually loaded, or 54 seconds. The main object was to prevent spillage of the coal and to insure a full bucket each trip.

The highest tonnage handled when the skips were manually loaded was at the rate of 1,141 tons per hour for an 8-hour period.

The maximum tonnage hoisted after the skips were provided with the auto-

matic loaders was at the average rate of 1,350 tons per hour for a period of 6 hours and 55 minutes. It is interesting to observe that they actually had an operating cycle of 50½ seconds over this period, in comparison with the estimated cycle of 54 seconds.

To avoid breakage, the two 9¼-ton skip buckets discharge the coal rather slowly as they dump out, so this limits the hoisting speed. The skip buckets can be loaded faster than they can be dumped, but the dumping arrangement can not be speeded up without increasing the breakage.

The Link-Belt automatic loaders are a particularly interesting part of this bottom arrangement because of their size and the speed at which they operate. The returning skip buckets travel 900 f. p. m. at the time of engaging the loaders. About 12 ft. of skip travel takes place from the time a skip bucket engages a loader until it is on the bottom, and only 13 seconds are required for the loading and dumping cycle.

Word has just been received by Bullard-Davis, Inc., that the Canadian House of Commons has included "safety helmets for miners" among items which can be brought into Canada without duty. This classification applies to hard-boiled helmets. Previously to this new ruling, hard-boiled hats have been paying a 35 percent duty. The new ruling will reduce the price to the user.

Preserving Wood Structures

The Grasselli Chemical Co., of Cleveland, Ohio, has recently issued an illustrated booklet, "Looking Ahead Twenty Years in Wood Utility," which stresses the advantages of standard methods of wood preservation for new uses of treated wood. Information is given on wood preservation in the United States, on standard specifications, and practical data on costs, inspection, and utilization of zinc chloride treated lumber. It is explained that zinc chloride treatment, by preventing rot and insect attack, reduces maintenance costs of wood structures, and has additional advantages of long-time proven service records, wide availability, low cost, and giving a clean, paintable, fire retardant, odorless product very similar in appearance to untreated lumber. The booklet should be of special interest to textile and paper-mill owners and operators, to architects, engineers, and builders specializing in mill construction, and to highway engineers, mine operators, and others interested in wood preservation.

Westinghouse Lamp Company Opens Lighting Institute

Depicting the application of electric light to all phases of life, commerce and industry, the Westinghouse Lighting Institute will be opened in Grand Central Palace, New York City, the latter part of May. This permanent institute for the advancement of the art of modern lighting will be conducted under the auspices of the Westinghouse Lamp Company.

The opening of the institute will be coincident with the opening of the convention of the National Electric Light Association in Atlantic City and the inauguration of "Light's Golden Jubilee."

The mark of differentiation of this institute of applied lighting from that of an ordinary exhibit is that it is a permanent institution that will be an ever-changing demonstration of modern practices of artificial illumination.

Likewise the changing conditions that may be observed as time progresses will be the result, not only of the work of the founders, but of the profession of lighting engineers throughout the country. It is a gigantic permanent experimental laboratory open to scientists, engineers, architects, designers and all others of every branch of industry seeking the solution of lighting problems.

Sullivan Machinery Co., Chicago, has removed its offices from the Peoples Gas Building, 122 South Michigan Avenue, to the seventh and eighth floors of the Wrigley Building, 400 North Michigan Avenue.

Design of the new skip loader installed at the shaft bottom of the Zeigler No. 1 mine of Bell & Zoller



New Koppers-Rheolaveur Plants

Koppers-Rheolaveur Company is building for the Koppers Coal Company, at their Carswell Mine, near Kimball, W. Va., a 250-ton-per-hour washing plant for washing coal 5 in. x ½ in. in size. The plant is so arranged that the capacity can be increased to 450 or 500 tons per hour. This colliery, which has recently been purchased from the Houston Collieries Co., consists of two shafts feeding coal to a common tippie where this coal is hand picked, sized and prepared for market. Provision is being made in the new addition to the plant to screen out the minus ½-in. coal, the balance then being sent to the washing plant. The plant is expected to be in operation in August or September of this year.

Equipment consisting of a free discharge Rheolaveur plant has recently been furnished to the Lehigh Coal and Navigation Company for installation at their Cranberry Creek Colliery at Hazleton, Pa. This plant will be capable of washing approximately 90 tons per hour of rice and barley coal and will be in operation around the first of May.

Koppers-Rheolaveur is also to build a 3,000-ton breaker, complete, for the Lehigh Valley Coal Company at their Dorrance Colliery, to take the place of a dry cleaning breaker which has been in operation for the past 40 or 50 years. All of the coal will be loaded by a belt loading boom on one or two trucks. Dorrance coal is derived from several veins and is conveyed to the surface by a four-compartment shaft, which will be furnished with new head frame and self-dumping cages. The mine run coal will be discharged onto a 42-in. belt conveyor 550 ft. long, by which it will be delivered to the breaker located immediately west of the present structure. In this breaker there will be a Rheolaveur plant capable of washing 40 tons per hour.

The second unit which will complete the installation of the Rheolaveur in the Loomis Breaker will be ready for operation at a very early date, and after this has been run for a reasonable length of time, interesting information relative to a 6,000-ton-per-day anthracite breaker may be ready for publication.

Magnetic Separation Equipment

The Magnetic Mfg. Co. has issued a new bulletin, No. 80, especially devoted to magnetic separation equipment for the concentration of ores and minerals. This new bulletin is just off the press and is very instructive along this line, containing the theoretical and practical experience gained during the past 30 years of exclusive study of this field.

Roberts & Schaefer Installing New Cleaning Equipment

Roberts & Schaefer Company, Chicago, announce the following contracts recently awarded them:

Clinton Block Coal Company, Imperial, Pa., combination Menzies Hydro-Separator-Arms air concentrator coal cleaning plant, capacity 150 tons per hour, work to be completed August 1.

Ennis Coal Company, Hiawatha, W. Va., Menzies-Hydro-Separator coal washing equipment, capacity 50 tons per hour, work to be completed May 1.

Hillman Coal and Coke Company, Jerome, Pa., Menzies Hydro-Separator coal washing equipment, capacity 50 tons per hour, work to be completed June 1.

Knott Coal Corporation, Anco, Ky., Menzies hydro-separator coal washing equipment; capacity 50 tons per hour, for cleaning egg coal; work to be completed July 1.

C. H. Mead Coal Company, East Gulf, W. Va., Menzies hydro-separator coal washing equipment; capacity 100 tons per hour, to clean egg, stove and pea coal; work to be completed July 1.

Pittsburgh Coal Washer Contracts

Contracts for coal cleaning and preparation plants and equipment which have recently been awarded the Pittsburgh Coal Washer Co., of Pittsburgh, Pa., are the following:

Ashland Coal & Coke Co., Ashland, W. Va. Coal cleaning plant employing the Peale-Davis type tables. All steel construction. Capacity, 150 tons per hour.

The New River Co., Macdonald, W. Va. Combined tippie and washery. Pittsburgh jigs for washing the pea, nut, and stove sizes. All steel construction with reinforced concrete settling tanks. Capacity of tippie, 400 tons per hour. Capacity of washer, 150 tons per hour.

Houston Collieries Co., Kimball, W. Va. Vibratory screen installation, employing six Pittsburgh vibratory screens. All steel construction. Capacity, 300 tons per hour.

Merrill Coal Mines, Inc., Henlawson, Logan Co., W. Va. Coal cleaning plant employing American tables. All steel construction. Capacity, 220 tons per hour.

H. T. Wilson Coal Co., Logan, W. Va. Trip feeder, trip maker, rotary dump, and conveyor installation. All steel construction. Capacity, 250 tons per hour.

The New River Co., Macdonald, W. Va. Complete tippie equipment, including cages, weigh baskets, shaker screens, loading booms, etc. Steel construction. Capacity, 350 tons per hour.

Pittsburgh vibratory screen installations for Lincoln Gas Coal Co., Pitts-

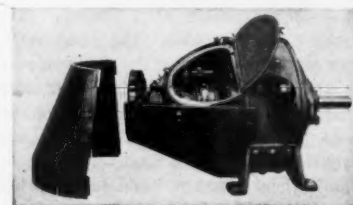
burgh, Pa.; Carnegie Steel Co., Edgar Thompson Works; Carnegie Steel Co., Duquesne Works; and The New River Co., Macdonald, W. Va.

Fan Cooled Type Sk Motor

The Westinghouse Electric and Manufacturing Company has recently announced a new type SK totally enclosed fan-cooled motor for direct-current applications.

In recognition of the demand for simplicity and interchangeability of parts, the standard type SK construction and parts were utilized to the fullest extent in the fan-cooled motor. All mechanical parts with the exception of the shaft are interchangeable with those parts used on the present totally enclosed motor of the same frame size.

The essential mounting dimensions of the new type motor are the same as on



the standard open type SK motor of the same frame size.

The cooling system does not interfere with the effectiveness of the motor enclosure. The bracket openings are closed with solid flat enclosing covers and gaskets. This type of construction permits the use of sealed sleeve bearings, and thus the motor is totally enclosed and sealed from dust and fumes.

The commutator end of the motor is further enclosed with a sheet-steel cover which has a perforated protective end through which the fan draws the cooling air. The cooling air is directed over the bracket and passes out over the top of the motor, covering approximately three-quarters of the surface of the motor.

This motor is applicable to coal-handling equipment, paint shops, foundries, and anywhere where the air is full of foreign matter which may be injurious to motor windings.

The Staples-Sweeney Manufacturing Company has been given a contract to build for the Stevens Coal Company, of Wilkes-Barre, Pa., a Chance Coal Cleaner washery at the Cameron Bank near Shamokin, Pa. The equipment consists of an intake conveyor, the usual screens and rolls, one 15-ft. Chance cone and appurtenances and will recover about 800 tons per day from the Cameron Bank material, which will run from rice to egg sizes.

Specify "Oxwelding under Procedure Control"

ONE of the most significant factors in the welding field is the attention being given to procedure specifications in important welding operations. Uniform dependability of the joint oxwelded under Linde procedure control has made it the most popular joint where strength, tightness, and ductility in the completed weld are required.



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Dissolved Acetylene

The Prest-O-Lite Company, Inc.

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Apparatus and Supplies

Oxweld Acetylene Company

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235 Carbide Warehouse Stocks

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Oxweld Acetylene Co.

ACID, SULPHURIC
Irvington Smelt. & Ref. Works.

AERIAL TRAMWAYS
American Steel & Wire Co.

AFTERCOOLERS (Air)
Ingersoll-Rand Co.

AIR COMPRESSORS
Allis-Chalmers Mfg. Co.
Sullivan Machinery Co.
Ingersoll-Rand Co.

AIR COMPRESSOR OILS
Standard Oil Co. (Ind.)

AIR FILTERS—Bag type
American Coal Cleaning Corp.

AIR HEATERS
Westinghouse Electric & Mfg. Co.

AIR LIFT PUMPING
Sullivan Machinery Co.

ALL SERVICE GAS MASKS
Mine Safety Appliances Co.

ANEMOMETERS
Mine Safety Appliances Co.

ANNUNCIATOR WIRES & CABLES
Roebbing's Sons Co., J. A.

ANNUNCIATOR WIRES & CABLES, INSULATED
American Steel & Wire Co.

ANTI-RUST OILS & GREASES
Standard Oil Co. (Ind.)

ARMATURE COILS & LEADS
General Electric Co.
Roebbing's Sons Co., J. A.
Westinghouse Electric & Mfg. Co.

ARMORGRIDS
General Electric Co.

ASPIRATORS
American Coal Cleaning Corp.

AUTOMATIC CAR & CAGER STOPS
Link-Belt Co.
Mining Safety Device Co.

AUTOMATIC CAR CAGES
Connellsville Mfg. & Mine Supply Co.

AUTOMATIC CAR DUMPERS
Link-Belt Co.
Roberts & Schaefer Co.

AUTOMATIC FLAGGING SIGNALS
American Mine Door Co.

AUTOMATIC (Mine Doors, Trucks and Electric Switches)
American Mine Door Co.

AUTOMATIC MINE SWITCHES
Westinghouse Electric & Mfg. Co.

AUTOMATIC SWITCH THROWERS
American Mine Door Co.
Westinghouse Electric & Mfg. Co.

AUTOMOBILE CABLES
Roebbing's Sons Co., J. A.

AUTOMOTIVE LUBRICANTS
Keystone Lubricating Co.

BAG TYPE AIR FILTERS
American Coal Cleaning Corp.

BALLAST UNLOADER ROPES
Roebbing's Sons Co., J. A.

BAR, STEEL
Carnegie Steel Co.
Timken Roller Bearing Co.

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E. I. du Pont de Nemours & Co.

BATTERIES, Armature
Westinghouse Electric & Mfg. Co.

BATTERIES, Blasting
Hercules Powder Co.

BATTERIES, DRY (for Bells, Buses, Signals, Blasting)
National Carbon Co., Inc.

BATTERIES (Storage, Gas Welding, Cutting, Dissolved Acetylene)
Prest-O-Lite Co.
Westinghouse Electric & Mfg. Co.

BATTERY CHANGING STATION
Atlas Car & Mfg. Co.

BEARINGS (for all kinds of equipment)
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BEARINGS, RADIAL
Timken Roller Bearing Co.

BEARINGS, TAPERED ROLLER
Timken Roller Bearing Co.

BEARINGS, THRUST
Timken Roller Bearing Co.

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Roebbing's Sons Co., J. A.

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Link-Belt Co.

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Morse Chain Co.

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Link-Belt Co.

BIT BOXES
Mine Safety Appliances Co.

BITS, Carbon (Diamonds) for Core Drill
R. S. Patrick.
Diamond Drill Carbon Co.

BITS, Diamond Drilling
R. S. Patrick.

BIT SHARPENERS
Sullivan Machinery Co.
Ingersoll-Rand Co.

BLACK DIAMONDS
Diamond Drill Carbon Co.
R. S. Patrick.

BLACK OILS
Standard Oil Co. (Ind.)

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BLASTING CAPS
E. I. du Pont de Nemours & Co.
Hercules Powder Co.

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BLASTING POWDER
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Hercules Powder Co.

BLASTING SUPPLIES
Hercules Powder Co.

BLASTING UNITS (Dry Battery)
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American Coal Cleaning Corp.
General Electric Co.
Ingersoll-Rand Co.
The Jeffrey Mfg. Co.
Robinson Ventilating Co.

BLOWERS (or Compressors)
General Electric Co.

BLOWERS (Tubing)
The Jeffrey Mfg. Co.
Robinson Ventilating Co.

BLOWERS (Turbine)
Robinson Ventilating Co.

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Welding, Welding and Cutting
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Phillips Mine & Mill Supply Co.

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American Mine Door Co.

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Diamond Drill Carbon Co.

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Central Frog & Switch Co.

BRACES, TRACK
Central Frog & Switch Co.

BRAZILIAN ROCK CRYSTAL
Diamond Drill Carbon Co.

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Koppers-Rheolaveur Co.
Vulcan Iron Works.

BREAKERS
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Goodman Mfg. Co.

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Vulcan Iron Works.

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The Jeffrey Mfg. Co.
Link-Belt Co.

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Mine Safety Appliances Co.

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Standard Oil Co. (Ind.)

CABLE—DRILLING, WIRE
American Cable Co.

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American Cable Co.

CABLE GREASE
Keystone Lubricating Co.

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American Cable Co.

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American Cable Co.

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Roebbing's Sons Co., J. A.

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American Mine Door Co.

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General Electric Co.
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American Cable Co.
Roebbing's Sons Co., J. A.

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Link-Belt Co.

CABLE—WIRE
American Cable Co.

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Roberts & Schaefer Co.

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Mining Safety Device Co.
Roberts & Schaefer Co.

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Mining Safety Device Co.
Phillips Mine & Mill Supply Co.
Roberts & Schaefer Co.

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Mining Safety Device Co.
Roberts & Schaefer Co.

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Allis-Chalmers Mfg. Co.
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Connellsville Mfg. & Mine Sup. Co.
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Vulcan Iron Works.

CAGES (Self-dumping)
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Roberts & Schaefer Co.
Vulcan Iron Works.

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Vulcan Iron Works.

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Union Carbide Sales Co.

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Diamond Drill Carbon Co.
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Oxweld Acetylene Co.

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Mine Safety Appliances Co.

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National Carbon Co., Inc.

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Oxweld Acetylene Co.
National Carbon Co., Inc.

CARBON SPECIALTIES (Circuit Breaker Contacts, Packing Rings, Filter Plates, Tubes, etc.)
National Carbon Co., Inc.

CAR DUMPERS, GRAVITY & POWER
Link-Belt Co.
Mining Safety Device Co.
Phillips Mine & Mill Supply Co.
Roberts & Schaefer Co.

CAR DUMPERS (Rotary)
Connellsville Mfg. & Mine Supply Co.
Link-Belt Co.
Mining Safety Device Co.
Phillips Mine & Mill Supply Co.
Roberts & Schaefer Co.

CAR FEEDERS
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Mining Safety Device Co.
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CAR HAULS
Goodman Mfg. Co.
Hockensmith Wheel & Mine Car Co.
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CAR REPLACERS
Johnson Wrecking Frog Co.

CAR RERAILERS
Johnson Wrecking Frog Co.

CAR RETARDERS
Link-Belt Co.
Mining Safety Device Co.
Roberts & Schaefer Co.

CARS OF ALL DESCRIPTION
Hockensmith Wheel & Mine Car Co.

CAR STOPS, AUTOMATIC & MANUAL
Link-Belt Co.
Phillips Mine & Mill Supply Co.
Roberts & Schaefer Co.

CAR WHEEL LUBRICANTS
Keystone Lubricating Co.

CAR WIRE & CABLES
American Steel & Wire Co.
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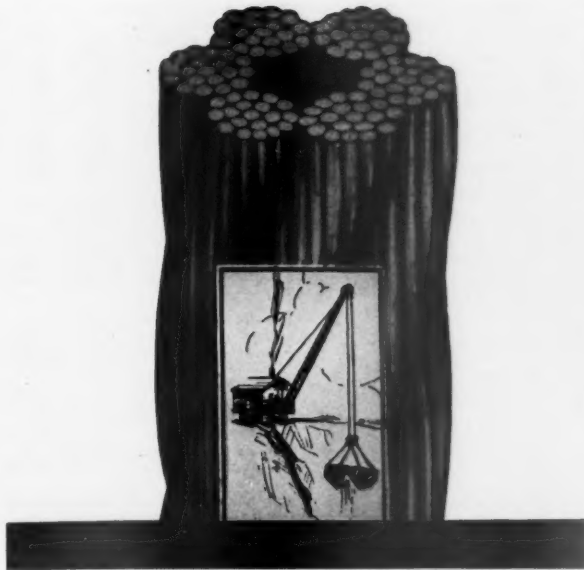
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The Jeffrey Mfg. Co.
Timken Roller Bearing Co.

CASTINGS, GRAY IRON
Link-Belt Co.
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Vulcan Iron Works.

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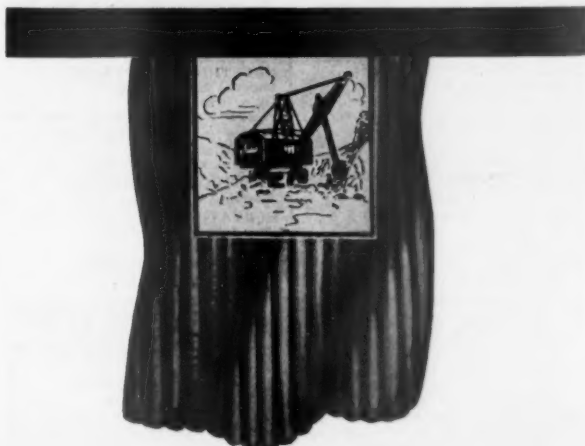
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Link-Belt Co.
Morse Chain Co.

CHAINS, FRONT END

Link-Belt Co.
Morse Chain Co.

CHAIN LUBRICANTS

Standard Oil Co. (Ind.)

CHAINS, OILING

Morse Chain Co.

CHAINS, POWER TRANSMISSION

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Link-Belt Co.
Morse Chain Co.

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CHAINS, SILENT (Rocker-Joint)

Morse Chain Co.

CHAINS, SLING

Link-Belt Co.
Morse Chain Co.

CHAINS, SPROCKET WHEEL

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The Jeffrey Mfg. Co.
Link-Belt Co.
Morse Chain Co.

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Westinghouse Electric & Mfg. Co.

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Westinghouse Electric & Mfg. Co.

CLAMPS (Trolley)

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Westinghouse Electric & Mfg. Co.

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American Cable Co.

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CLUTCHES

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Goodman Mfg. Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

COAL CLEANING MACHINERY

American Coal Cleaning Corp.

Koppers-Rheolaueur Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Roberts & Schaefer Co.

COAL COMPANIES

Lehigh Coal & Navigation Co.

COAL CONVEYING MACHINERY

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Conveyor Sales Co.

Link-Belt Co.

COAL CRUSHERS

Connellsville Mfg. & Mine Supply Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

COAL CRUSHERS & ROLLS

The Jeffrey Mfg. Co.

Link-Belt Co.

Vulcan Iron Works.

COAL CUTTERS

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Ingersoll-Rand Co.

The Jeffrey Mfg. Co.

Sullivan Machinery Co.

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American Coal Cleaning Corp.

Conveyor Sales Co.

Goodman Mfg. Co.

The Jeffrey Mfg. Co.

Joy Manufacturing Co.

Link-Belt Co.

Mining Safety Device Co.

Roberts & Schaefer Co.

Westinghouse Electric & Mfg. Co.

COAL LOADERS

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Goodman Mfg. Co.

The Jeffrey Mfg. Co.

Joy Manufacturing Co.

Link-Belt Co.

Sullivan Machinery Co.

COAL MINING MACHINERY

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Ingersoll-Rand Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Sullivan Machinery Co.

Westinghouse Electric & Mfg. Co.

COAL MINING PLANTS

American Coal Cleaning Corp.

Goodman Mfg. Co.

Ingersoll-Rand Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Roberts & Schaefer Co.

COAL PREPARATION MACHINERY

American Coal Cleaning Corp.

Link-Belt Co.

Roberts & Schaefer Co.

COAL SEPARATING MACHINERY

W. S. Tyler Co.

COAL SEPARATORS (Pneumatic)

American Coal Cleaning Corp.

Roberts & Schaefer Co.

COAL SEPARATORS (Spiralizers)

Link-Belt Co.

COAL TESTING EQUIPMENT

W. S. Tyler Co.

COMPRESSORS, AIR

Allis-Chalmers Mfg. Co.

Ingersoll-Rand Co.

Sullivan Machinery Co.

COMPRESSORS, MINE CAR

Ingersoll-Rand Co.

Sullivan Machinery Co.

CONCENTRATORS (Table)

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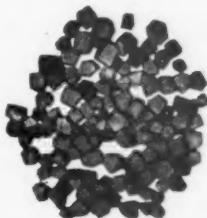
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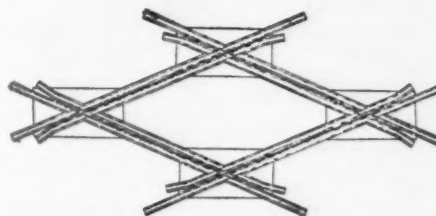
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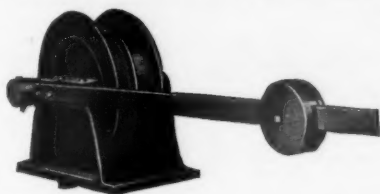
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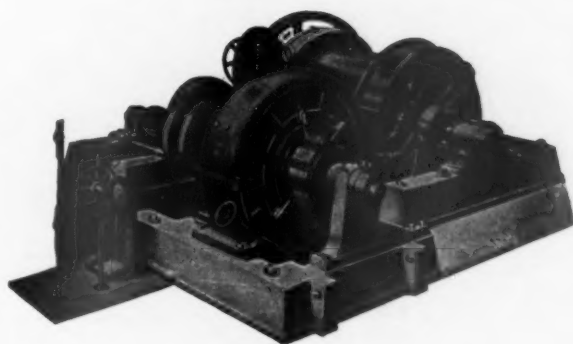
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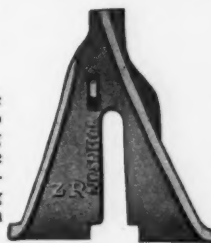
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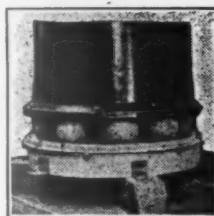
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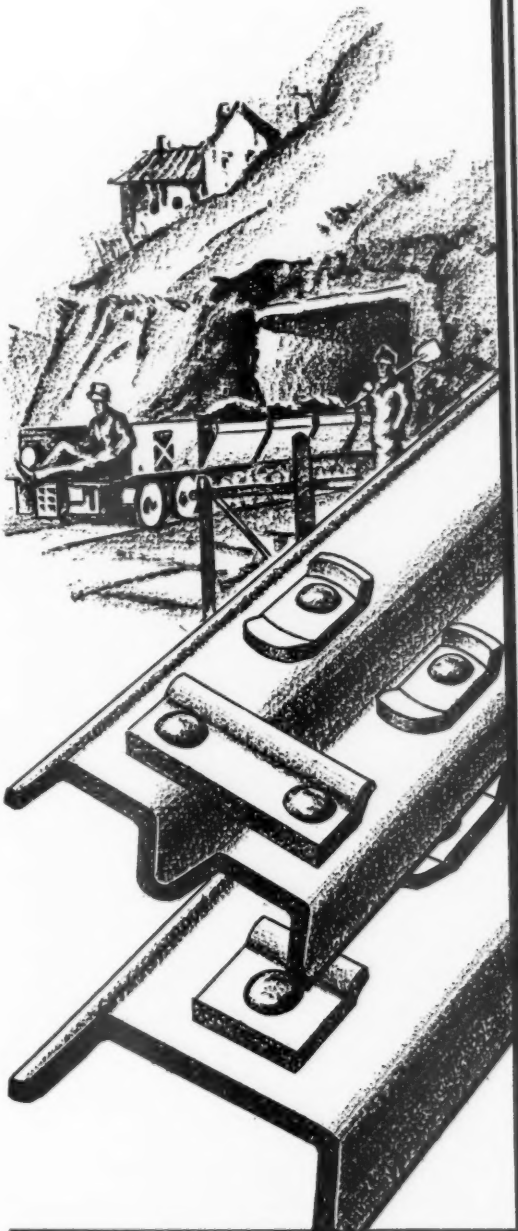
Stock and Special Signs, Codes, Etc., for Mines

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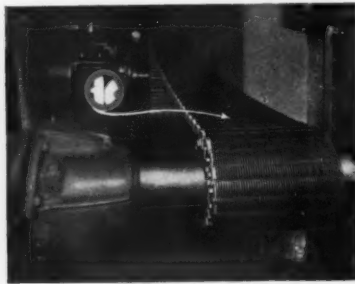
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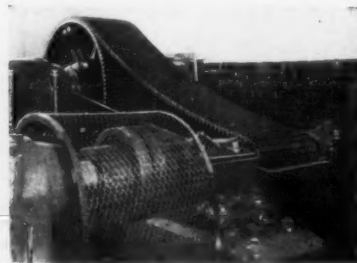
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